Instructions

Wolverine® Chemical Injection Pump

3A9525B

EN

An electric pump, consisting of a drive module and a fluid module, for injecting chemicals at well sites. For professional use only.

Not approved for use in explosive atmospheres or hazardous (classified) locations, unless otherwise stated in the model approvals section.

See page 4 for model information, including maximum working pressure and approvals.

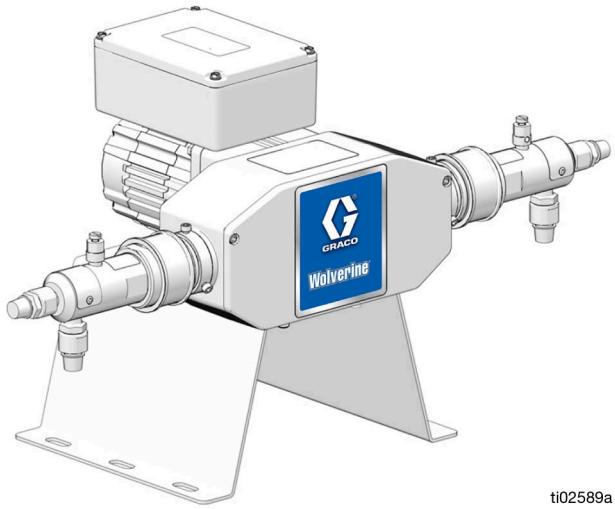
Important Safety Instructions

Read all warnings and instructions in this manual and the related manuals before using the equipment. Be familiar with the proper control and usage of the equipment. Save these instructions.

Related Manuals

Find English manuals and any available translations at www.graco.com.

English Manual Number	Description
334993	Harrier Chemical Injection Controller
3A4047	Harrier AC Chemical Injection Controller
----	Bodine Manual, included with product



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Contents

Models

Fluid Modules

Model No.	Configuration No.	Plunger Size	Maximum Working Pressure psi (MPa, bar)	Theoretical Volume for Full Stroke (cc/stroke)
2A30401	CI-25-XBS-0	1/4 in.	6000 (41.3, 413)	0.8
2A30401ND	CI-25-XBS-ND			
2A30402	CI-25-XCS-0			
2A30402ND	CI-25-XCS-ND			
2A30403	CI-25-XDS-0			
2A30403ND	CI-25-XDS-ND			
2A30501	CI-38-XBS-0	3/8 in.	2500 (17.2, 172)	1.8
2A30501ND	CI-38-XBS-ND			
2A30502	CI-38-XCS-0			
2A30502ND	CI-38-XCS-ND			
2A30503	CI-38-XDS-0			
2A30503ND	CI-38-XDS-ND			
2A30513T12	CI-38-ZDS-T			
2A30501S	CI-38-SBS-S			
2A30601	CI-50-XBS-0	1/2 in.	1250 (8.6, 86)	3.2
2A30601ND	CI-50-XBS-ND			
2A30602	CI-50-XCS-0			
2A30602ND	CI-50-XCS-ND			
2A30603	CI-50-XDS-0			
2A30603ND	CI-50-XDS-ND			
2A30613T12	CI-50-ZDS-T			
2A30701	CI-63-XBL-0	5/8 in.	900 (6.2, 62)	5.0
2A30702	CI-63-XCL-0			
2A30703	CI-63-XDL-0			
2A30713T12	CI-63-ZDL-T			
2A30801	CI-75-XBL-0	3/4 in.	600 (4.1, 41)	7.2
2A30802	CI-75-XCL-0			
2A30803	CI-75-XDL-0			

Drive Modules

Drive Module Pressure Capability

Plunger Size	Motor Type
	L - Large (CI-xxL-xx-x) H - Hazardous Location C1D1 (CI-xxH-xx-x) B - Variable Speed Brushless (CI-xxB-xx-x) X - ATEX (CI-xxX-xx-x)
	Maximum Working Pressure psi (MPa, bar)
1/4 in.	6000 (41.3, 413)
3/8 in.	2500 (17.2, 172)
1/2 in.	1250 (8.6, 86)

Plunger Size	Motor Type
	L - Large (CI-xxL-xx-x) H - Hazardous Location C1D1 (CI-xxH-xx-x) B - Variable Speed Brushless (CI-xxB-xx-x) X - ATEX (CI-xxX-xx-x)
	Maximum Working Pressure psi (MPa, bar)
5/8 in.	900 (6.2, 62)
3/4 in.	600 (4.1, 41)

Wolverine® Advanced Drive Modules

Model No.	Drive Configuration	Voltage	Motor	Approvals
2A30021	CI-12L-0	12 VDC	Large	CE Not approved for use in European explosive atmospheres or hazardous locations
2A30041	CI-1AL-0	115 VAC	Large	

Wolverine Continuous Injection Drive Modules (C1 D2)

Model No.	Drive Configuration	Voltage	Motor	Motor Approvals
2A30201	CI-12B-0	12 VDC	Variable Speed Brushless	c UL us Class I, Division 2 Groups A, B, C, D
2A30211	CI-24B-0	24 VDC	Variable Speed Brushless	

Wolverine Hazardous Location Drive Modules (C1 D1)

Model No.	Drive Configuration	Voltage	Motor	Motor Approvals
2A30101	CI-12H-0	12 VDC	Hazardous Location	UL Class I, Group C & D, Class II, Group F & G
2A30121	CI-24H-0	24 VDC	Hazardous Location	
2A30141	CI-3AH-0	115/230 VAC	Hazardous Location	CSA® Class I, Group C & D, Class II, Group F & G, T3C

Wolverine ATEX Drive Modules

Model No.	Drive Configuration	Voltage	Motor	Drive Module Approvals
2A30073	CI-2AX-X	230 VAC	ATEX	 Ex d IIB T4 Gb -20°C≤Ta≤+60°C 
				 Ex d IIB T4 Gb -20°C≤Ta≤+60°C

Drive Module Configuration Code

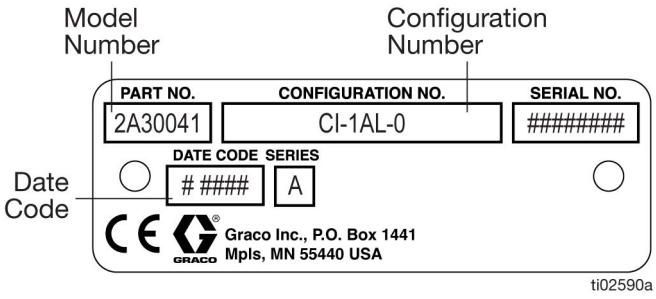


FIG. 1: Example of the Drive Module Identification Plate

Sample Configuration Number: CI-1AL-0

CI	1A	L	0
Chemical Injection	Voltage	Motor	Qualifier

Voltage		Motor		Qualifier	
12	12 VDC	L	Large	0	None
24	24 VDC	H	Hazardous Location CID1	X	ATEX
1A	115 VAC	B	Continuous Injection Variable Speed, Brushless CID2		
2A	230 VAC	X	ATEX		
3A	115/230 VAC				

NOTE: Effective Date Code X 2516 (FIG. 1). If the configuration does not match this format, it is an older drive module assembly configuration. See Wolverine Chemical Injection Pump manual, revision C.

NOTE: Not all combinations are possible.

Fluid Module Configuration Code

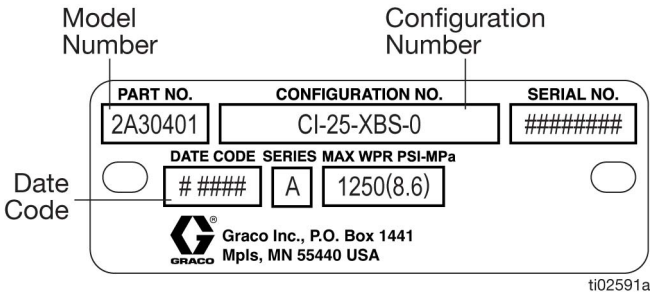


FIG. 2: Example of the Fluid Module Identification Plate

Sample Configuration Number: CI-25-XBS-0

CI	25	X	B	S	0
Chemical Injection	Plunger Size	Plunger Coating	Seal Material	Adapter Size	Qualifier

Plunger Size		Plunger Coating		Seal Material		Adapter Size		Qualifier	
25	1/4 in.	X	Chromex	B	FKMETP	S	Small	0	None
38	3/8 in.	Z	Full Ceramic	C	HNBR	L	Large	ND	No Drip
60	1/2 in.	S	Non coated SST	D	FFKM			T	Severe Duty T12
63	5/8 in.							S	Non coated SST
75	3/4 in.								

NOTE: Effective Date Code X 2516 (FIG. 2). If the configuration does not match this format, it is an older fluid module assembly configuration. See Wolverine Chemical Injection Pump manual, revision C.

NOTE: See **Reconnect Fluid Module**, page 32, for fluid section installation instructions.

NOTE: Fluid module approvals information is found on page 4.

NOTE: For seal material chemical compatibility: https://www.graco.com/content/dam/graco/ong/literature/chem-compat/ONG_ChemCompGuideEN-A.pdf.

Key Points

Wolverine Advanced

- Advanced drive modules are higher quality, modular, and easily serviceable drive modules. These are available in numerous configurations.
- Advanced drive modules are available for use with one or two fluid modules and 12 VDC, 24 VDC, and 115/230 VAC 1 Phase.

Wolverine Hazardous Location (C1 D1)

- Hazardous Location drive modules are available as 12 VDC, 24 VDC, and 115/230 VAC 1 Phase.

Wolverine ATEX

- Explosive Atmosphere Zone 1 drive modules are available as 230 VAC.

Wolverine Continuous Injection Variable Speed (12 VDC and 24 VDC) (C1 D2)

- Continuous injection drive modules do not require a controller for operation. They feature an integral variable speed controller and are adjustable from 0-67 cpm.

Safety Symbols

The following safety symbols appear throughout this manual and on warning labels. Read the table below to understand what each symbol means.

Symbol	Meaning
	Burn Hazard
	Electric Shock Hazard
	Equipment Misuse Hazard
	Fire and Explosion Hazard
	Moving Parts Hazard
	Skin Injection Hazard
	Skin Injection Hazard
	Splash Hazard

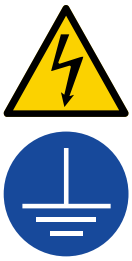
Symbol	Meaning
	Toxic Fluid or Fumes Hazard
	Do Not Place Hands or Other Body Parts Near Fluid Outlet
	Do Not Stop Leaks with Hand, Body, Glove or Rag
	Follow Pressure Relief Procedure
	Ground Equipment
	Read Manual
	Wear Personal Protective Equipment

Safety Alert Symbol
This symbol indicates: Attention! Become Alert! Look for this symbol throughout the manual to indicate important safety messages.

General Warnings

The following warnings apply throughout this manual. Read, understand, and follow the warnings before using this equipment. Failure to follow these warnings can result in serious injury.

⚠WARNING



ELECTRIC SHOCK HAZARD

This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.

- Turn off and disconnect all power before disconnecting any cables and before servicing or installing equipment.
- Connect only to grounded power source.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

FIRE AND EXPLOSION HAZARD

When flammable fluids are present in the work area, such as gasoline and windshield wiper fluid, be aware that flammable fumes can ignite or explode. To help prevent fire and explosion:

- Use equipment only in well-ventilated area.
- Eliminate all ignition sources, such as cigarettes and portable electric lamps.
- Ground all equipment in the work area.
- Keep work area free of debris, including rags and spilled or open containers of solvent and gasoline.
- Do not plug or unplug power cords or turn lights on or off when flammable fumes are present.
- Use only grounded hoses.
- **Stop operation immediately** if static sparking occurs or you feel a shock**.** Do not use equipment until you identify and correct the problem.
- Keep a working fire extinguisher in the work area.

SKIN INJECTION HAZARD

High-pressure fluid from dispensing device, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. **Get immediate surgical treatment.**

- Do not point dispensing device at anyone or at any part of the body.
- Do not put your hand over the fluid outlet.
- Do not stop or deflect leaks with your hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** when you stop dispensing and before cleaning, checking, or servicing equipment.
- Tighten all fluid connections before operating the equipment.
- Check hoses and couplings daily. Replace worn or damaged parts immediately.

⚠WARNING

MOVING PARTS HAZARD

Moving parts can pinch, cut or amputate fingers and other body parts.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.

TOXIC FLUID OR FUMES HAZARD

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.

- Read Safety Data Sheets (SDSs) to know the specific hazards of the fluids you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

BURN HAZARD

Equipment surfaces and fluid that is heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Specifications** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheets (SDSs) from distributor or retailer.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.

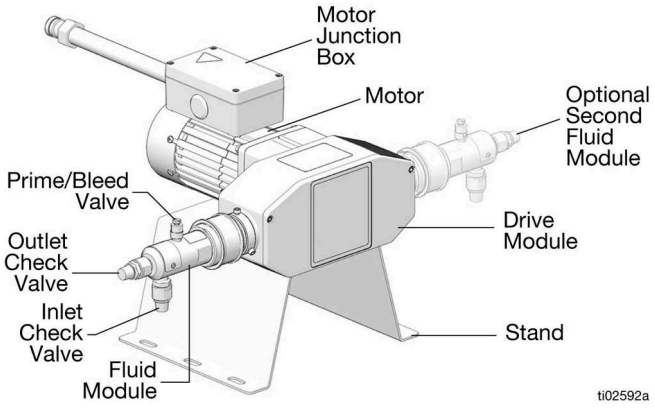
PERSONAL PROTECTIVE EQUIPMENT

Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. Protective equipment includes but is not limited to:

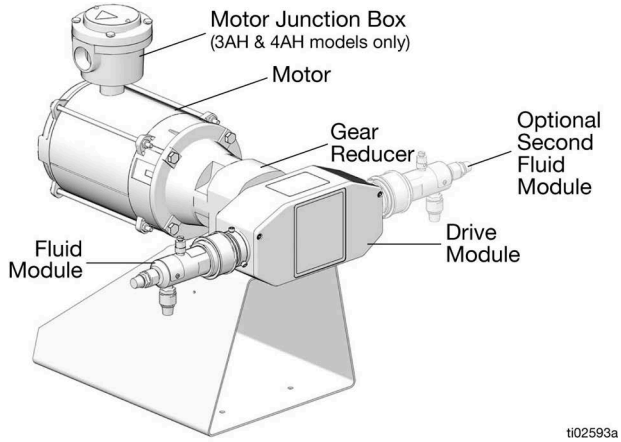
- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Component Identification

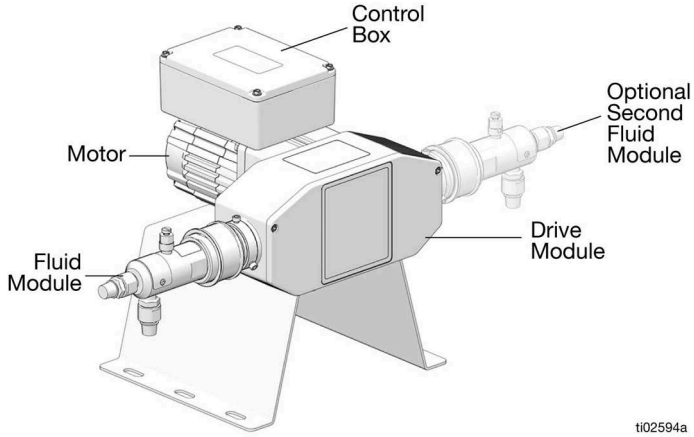
Wolverine Advanced



Wolverine Hazardous Location (C1 D1)



Wolverine Continuous Injection (C1 D2)



Wolverine ATEX

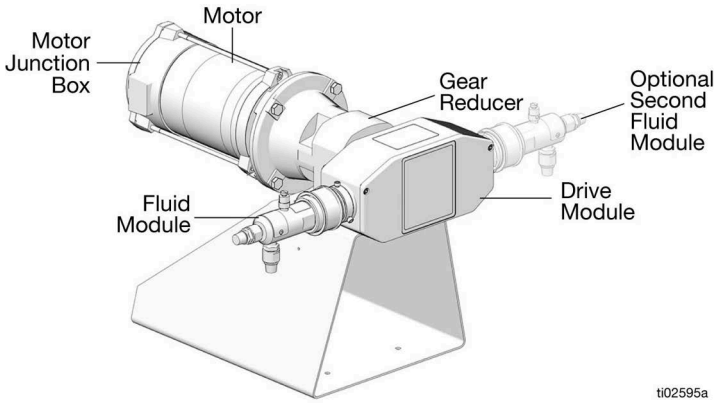


FIG. 3: Component Identification

Typical Installation

Ordinary Locations (Generic Power Source)

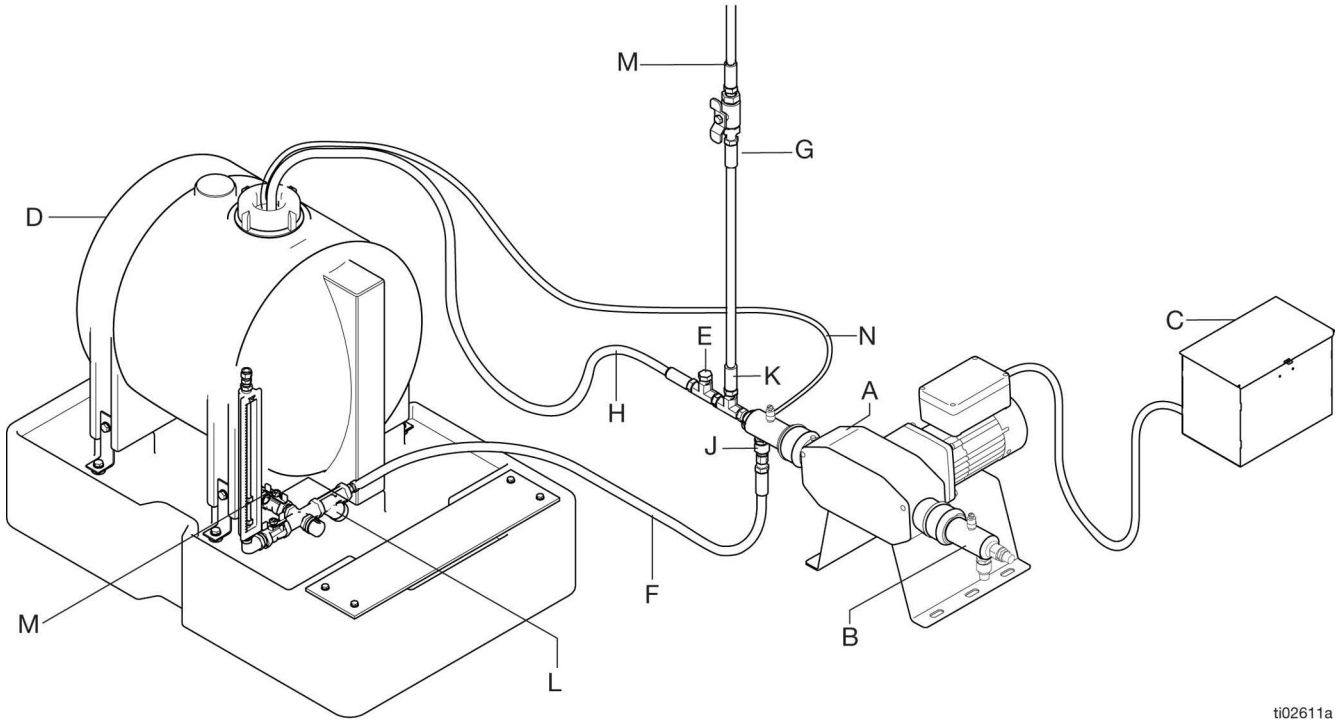


FIG. 4: Typical Installation: Ordinary Locations (Generic Power Source)

Key:

A Drive Module
B Fluid Module
C Power source
D Tank
E Pressure relief valve
F Inlet Line
G Outlet Line
H Pressure relief line
J Inlet port
K Outlet port
L Manifold assembly (includes Y-strainer and fluid shut off valve (N))
M Fluid shut off valve (inlet and outlet)
N Bleed/prime waste line

Hazardous Locations (C1 D1) and ATEX

An example of an installation with a Wolverine Hazardous Location chemical injection pump is shown in FIG. 5, your installation may differ from what is shown. See **Kits and Accessories**, page 42. The Wolverine pump (A) is the only component shown in FIG. 5 that is supplied by Graco. All other components are user-supplied by the customer.

NOTICE

The pump is heavy. Always use two people to lift or move the pump to prevent damage from being dropped.

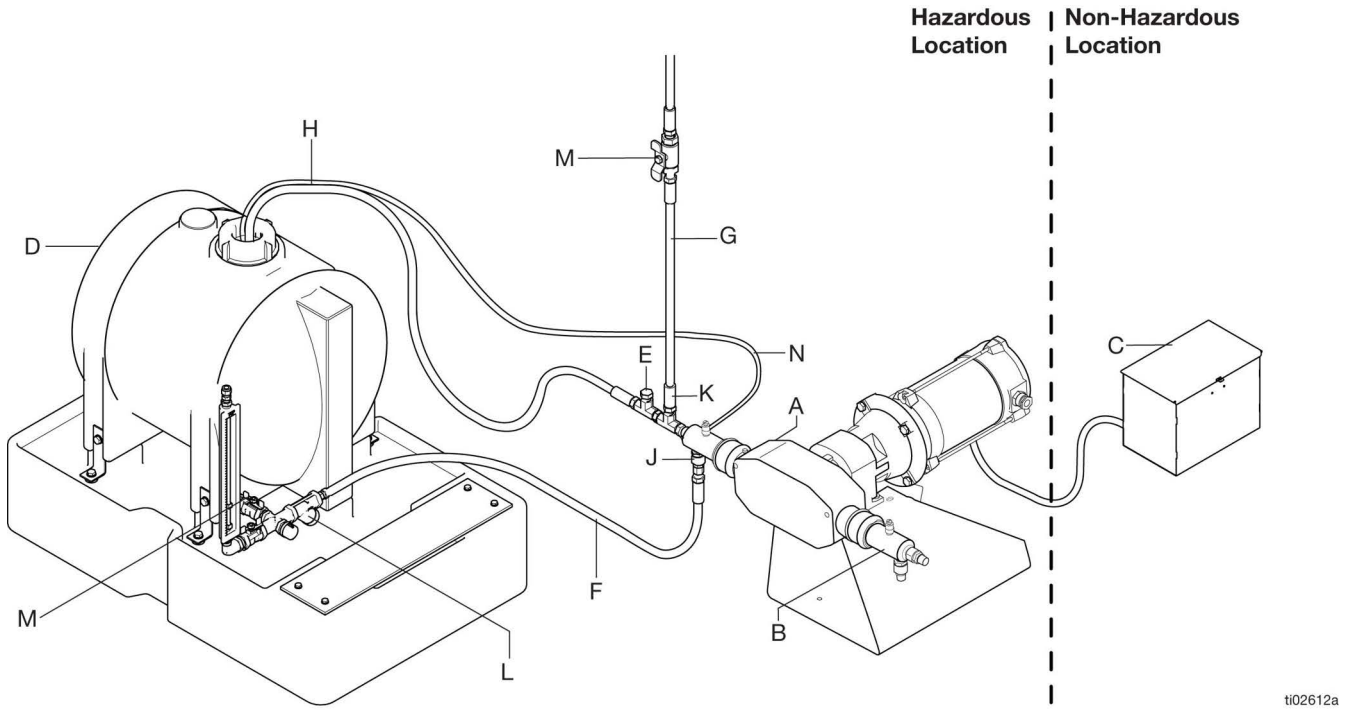


FIG. 5: Typical Installation: Hazardous Locations (C1 D1) and ATEX

Key:

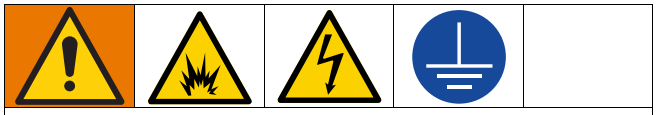
A Drive Module
B Fluid Module
C Power source
D Tank
E Pressure relief valve
F Inlet Line
G Outlet Line
H Pressure relief line
J Inlet port
K Outlet port
L Manifold assembly (includes Y-strainer and fluid shut off valve (N))
M Fluid shut off valve (inlet and outlet)
N Bleed/prime waste line

Installation

The pump consists of a fluid module and a drive module. Both modules are required for this installation.

All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

Grounding



The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

Pump: use ground instructions in **Motor Electrical Connections**, page 17.

Fluid hoses: use only electrically conductive hoses.

Fluid supply container: follow local code.

Installation of Fluid Module onto the Drive Module

Reference **Parts**, beginning on page 36 for this section.

1. Verify that power to the drive module is disconnected.
2. If installing:
   a. Single fluid module to the drive module, install the fluid module to the simplex drive position (the position without the black dust cover).
   b. Fluid module to the duplex drive position, remove and discard both the cover (28) and o-ring (27). **NOTE**: Removal of the o-ring (27) ensures correct alignment of the fluid module in the duplex position to the drive module.
3. Pull the fluid plunger (213) out from the fluid module enough to engage the stroke adjuster rod (3) on the drive module. If needed, the fluid plunger (213) can be removed from the fluid module.
4. Assemble the fluid plunger (213) to the drive module stroke adjuster rod (3) by sliding the button into the groove.
5. Insert the fluid plunger back into the fluid module, if removed in step 3.
6. Loosen the three cap screws (228) on the fluid module adapter (224).
7. Slide the fluid module onto the drive module so the three radial cap screws (228) are positioned above the groove on the drive module housing (1).
8. Rotate the fluid module so the inlet check (216) is in the down position.
9. Tighten the three cap screws to torque 20 - 30 in-lb (2.3 - 3.4 N•m).

Accessories

Install the required following accessories in the order shown in FIG. 4 and FIG. 5. See **Kits and Accessories**, page 42.

Fluid Line

- **Fluid filter (Y-strainer) (included in K):** with a 60 mesh (250 micron) stainless steel element to filter particles from the fluid before reaching the pump.
- **Fluid shutoff valve (L):** shuts off fluid flow.
- **Pressure relief valve (D):** overload protection.

Flush Before Using Equipment

The equipment was tested with lightweight oil, which is left in the fluid passages to protect parts. To avoid contaminating fluid with oil, flush the equipment with a compatible solvent before using the equipment. See **Flush the Equipment**, page 19.

Choose an Installation Location

- Select a location that supports the weight of the pump, the plumbing, and electrical connections.
- Refer to the mounting hole layout provided in **Dimensions**, starting on page 48.
- Always mount the pump upright.
- For mounting configurations that require installation different than depicted in FIG. 4 and FIG. 5, contact your Graco distributor for assistance.

Fluid Connections

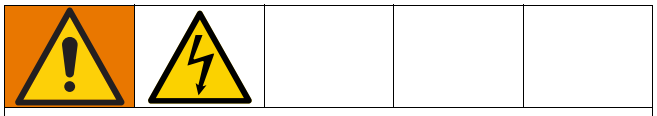
1. Remove and discard the plugs on the check valves.
2. Connect a 1/4 NPT(F) fluid line from the fluid source to the inlet port (J) (see FIG. 4, page 14 or FIG. 5, page 15). For No Drip fluid modules, connect a 1/4 NPT(F) fluid line from the fluid source to the tee fitting on the inlet check valve.
3. Install a pressure relief valve (E) on the outlet side of the pump.

NOTE: A pressure relief valve is available from Graco and can be connected back to the tank or directly to the inlet side of the pump. See **Kits and Accessories**, page 42.

In the event of an injection line blockage, reduce the risk of skin injection and damage to the pump by making sure that the pressure relief valve is set at or below the maximum working pressure of the pump.

4. Set the pressure relief valve at or below the maximum working pressure of the pump.
5. Connect a 1/4 NPT(F) fluid line from the outlet port (K) to the injection point.
6. Connect a 10-32 UNF fluid outlet from the prime/bleed valve (214) to the fluid source or waste reservoir.

Motor Electrical Connections



To reduce the risk of electrical shock:

- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.
- Install the pump with a dedicated means to disconnect the main power to the pump.

NOTICE

Branch circuit protection (user-supplied) is required on all models. To avoid equipment damage:

- Do not operate the pump without branch circuit protection installed.
- Branch circuit protection of the correct voltage and amperage must be installed in line with the power entry to the system.
- Branch circuit protection should be UL248 approved.
- See table for branch circuit protection rating.

Model No.	Configuration	Minimum Voltage	Branch Circuit Protection Rating
2A30021	CI-12L-0	12 VDC	20 A
2A30201	CI-12B-0	12 VDC	20 A
2A30101	CI-12H-0	12 VDC	25 A
2A30211	CI-24B-0	24 VDC	15 A
2A30041	CI-1AL-0	115 VAC	3 A
2A30141	CI-3AH-0	115 VAC (Single Phase)	5 A
2A30141	CI-3AH-0	230 VAC (Single Phase)	3 A
2A30073	CI-2AX-X	230 VAC	2 A
2A30121	CI-24H-0	24 VDC	15 A

For DC and AC Ordinary Location Single Phase Units

The drive module has 10 ft (3 m) of 1/2 in. flexible conduit connected to the motor with 12 ft (3.7 m) of motor leads.

1. Connect the conduit to the power source enclosure (C) with the included conduit fitting.
2. Connect the green motor wire to a ground location.
3. Connect the white motor wire to the positive (+) output of the power source.
4. Connect the black motor wire to the negative (-) output of the power source.

For Continuous Injection Variable Speed DC (C1 D2) (Model CI-xxB)

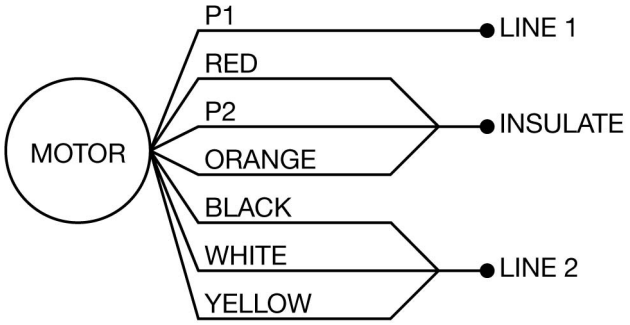
Refer to the motor manual included with continuous injection models for wiring instructions and motor operation.

For Hazardous Location (C1 D1) (Models CI-xxH)

The drive module has motor leads housed inside of the motor junction box. See FIG. 3, page 13.

1. Remove the motor junction cover box.
2. Connect user-supplied wires and user-supplied related conduit, rated per local electrical code. See FIG. 6, page 18, for wiring diagrams, and **Technical Specifications**, page 52, for current ratings.

115V / Single Phase (Low Voltage)



230V / Single Phase (High Voltage)

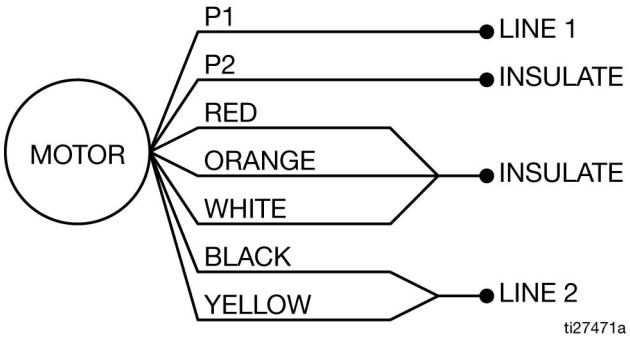


FIG. 6

3. Connect a user-supplied ground wire to the ground stud inside of the motor junction box.
4. Reinstall the motor junction box cover.

For ATEX AC (Model CI-2AX)

The drive module has motor leads housed inside of the back cover plate of the motor, see FIG. 3, page 13.

1. Remove the rear cover plate of the motor.
2. Connect user-supplied wires and user-supplied related conduit, rated per local electrical code. See FIG. 7 for wiring diagrams, and **Technical Specifications**, page 52, for current ratings.

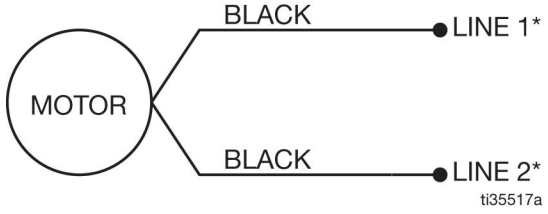


FIG. 7

Operation

Pressure Relief Procedure

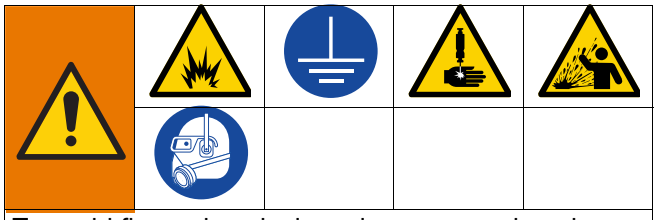
Follow the Pressure Relief Procedure whenever you see this symbol.

This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection and splashing fluid, follow the Pressure Relief Procedure when you stop dispensing and before cleaning, checking, or servicing the equipment.

NOTE: Always discharge fluid into an approved container or location.

1. Disconnect main power from the pump.
2. Turn off the inlet and outlet lines using the shutoff valve (M).
3. Slowly loosen the fitting connected to the outlet check valve (217) to relieve downstream fluid pressure.
4. Open the bleed valve (214) by turning the needle counter-clockwise with a flathead screwdriver to relieve internal pump fluid pressure.
5. Disconnect and cap the inlet and outlet fluid lines.

Flush the Equipment



To avoid fire and explosion, always ground equipment and waste container. To avoid static sparking and injury from splashing, always flush at the lowest possible pressure.

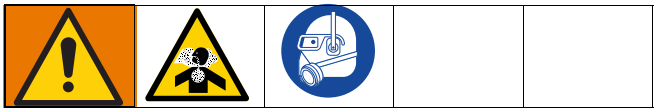
- Check fittings for leaks and tighten as necessary.
- Flush with fluid compatible with the fluid being dispensed and with the equipment's wetted parts.

1. Follow the **Pressure Relief Procedure**, page 19.
2. Connect the inlet to the supply source of the flushing fluid.
3. Connect the inlet to the waste reservoir.
4. Run the pump until the dispensed fluid is predominantly flushing fluid.
5. Follow the **Pressure Relief Procedure**, page 19.

Prime the Pump

1. Verify that all of the connections and fluid lines are tight.
2. Prime the pump by turning the prime valve needle (215) counter-clockwise.
3. Turn the pump on and begin cycling.
4. The pump is primed when the discharge from the prime valve housing (214) has transitioned from air, to a bubbly liquid chemical, to pure liquid chemical.
5. Close the prime valve needle (215) tightly and verify that fluid has stopped draining from the port.

Calibrate Chemical Dosage

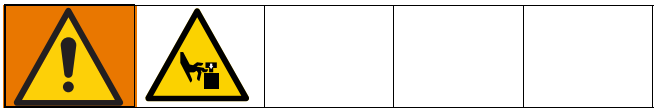


1. Set the cycle rate and stroke adjustment of the pump to the estimated setting for a desired flow rate. See **Baseline Chemical Dosage Settings**, page 21, for tables of cycles per minute (CPM), and corresponding gallons per day (GPD) and liters per day (LPD).
2. Follow the instructions provided with your calibration gauge in conjunction with the **Baseline Chemical Dosage Settings**, page 21.
3. Adjust the cycle rate and stroke adjustment accordingly after the test is performed:

- Increasing the pump cycle rate and stroke adjustment increases the pump flow rate.
- Decreasing the pump cycle rate and stroke adjustment decreases the pump flow rate.

4. Repeat the instructions provided with your calibration gauge to verify changes.
5. Repeat steps 3 and 4, as necessary, until the desired flow rate is achieved.

Stroke Adjustment



This pump has infinite stroke adjustment positions between full stroke and half stroke.

1. Disconnect the main power from the pump.
2. Expose the drive shaft (3a) by loosening the cap screws (24) and removing the drive guard (23). The cap screws (24) remain with the drive guard (23).
3. Loosen the stroke adjustment nuts (3b), and move to desired stroke location and re-tighten:

- Moving the adjustment nuts (3b) toward the pump decreases the stroke.
- Moving the adjustment nuts (3b) toward the cam increases the stoke.

4. Reassemble the drive guard (23) to the pump.

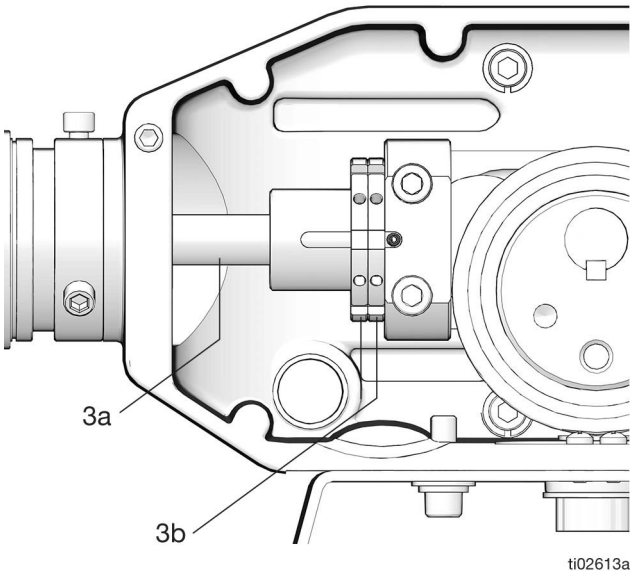


FIG. 8: Wolverine stroke adjustment

Baseline Chemical Dosage Settings

See **Stroke Adjustment**, page 20, for changing the stroke adjustment settings. Cycles per minute (CPM) is determined by controller settings for On/Off Time, or Cycles, if using a Harrier family chemical injection controller. Adjust the controller settings to change the CPM. Motor speed is also affected by voltage and back pressure. Find the flow rate above the desired injection rate for the correct sized plunger, then adjust the stroke and controller settings accordingly for the corresponding CPM.

NOTE: Double the values in the charts for configurations using two fluid modules.

NOTE: CI-12H pumps have a maximum CPM of 30, which translates to a 50 percent duty cycle.

NOTE: For continuous injection pumps (CI-xxB), pump CPM is determined by the knob setting on the integrated motor controller. Motor speed is set with the knob. Refer to the motor manual included with continuous injection models for motor operation.

CPM	1/4 in. Fluid Plunger			3/8 in. Fluid Plunger		
	GPD (LPD)			GPD (LPD)		
	Full Stroke	3/4 Stroke	1/2 Stroke	Full Stroke	3/4 Stroke	1/2 Stroke
5	1.5 (5.8)	1.1 (4.3)	0.8 (2.9)	2.8 (10.4)	2.1 (7.8)	1.4 (5.2)
10	3.1 (11.6)	2.3 (8.7)	1.5 (5.8)	5.5 (20.8)	4.1 (15.6)	2.8 (10.4)
15	4.6 (17.4)	3.4 (13.0)	2.3 (8.7)	8.3 (31.3)	6.2 (23.5)	4.1 (15.6)
20	6.1 (23.2)	4.6 (17.4)	3.1 (11.6)	11.0 (41.7)	8.3 (31.3)	5.5 (20.8)
25	7.6 (29.0)	5.7 (21.7)	3.8 (14.5)	13.8 (52.1)	10.3 (39.1)	6.9 (26.1)
30	9.2 (34.7)	6.9 (26.1)	4.6 (17.4)	16.5 (62.5)	12.4 (46.9)	8.3 (31.3)
35	10.7 (40.5)	8.0 (30.4)	5.4 (20.3)	19.3 (73.0)	14.5 (54.7)	9.6 (36.5)
40	12.2 (46.3)	9.2 (34.7)	6.1 (23.2)	22.0 (83.4)	16.5 (62.5)	11.0 (41.7)
45	13.8 (52.1)	10.3 (39.1)	6.9 (26.1)	24.8 (93.8)	18.6 (70.4)	12.4 (46.9)
50	15.3 (57.9)	11.5 (43.4)	7.6 (29.0)	27.5 (104.2)	20.7 (78.2)	13.8 (52.1)
55	16.8 (63.7)	12.6 (47.8)	8.4 (31.9)	30.3 (114.7)	22.7 (86.0)	15.1 (57.3)
60	18.4 (69.5)	13.8 (52.1)	9.2 (34.7)	33.0 (125.1)	24.8 (93.8)	16.5 (62.5)

CPM	1/2 in. Fluid Plunger			5/8 in. Fluid Plunger			3/4 in. Fluid Plunger		
	GPD (LPD)			GPD (LPD)			GPD (LPD)		
	Full Stroke	3/4 Stroke	1/2 Stroke	Full Stroke	3/4 Stroke	1/2 Stroke	Full Stroke	3/4 Stroke	1/2 Stroke
5	5.2 (19.7)	3.9 (14.8)	2.6 (9.8)	8.6 (32.6)	6.5 (24.4)	4.3 (16.3)	12.4 (46.9)	9.3 (35.2)	6.2 (23.5)
10	10.4 (39.4)	7.8 (29.5)	5.2 (19.7)	17.2 (65.2)	12.9 (48.9)	8.6 (32.6)	24.8 (93.8)	18.6 (70.4)	12.4 (46.9)
15	15.6 (59.1)	11.7 (44.3)	7.8 (29.5)	25.8 (97.7)	19.4 (73.3)	12.9 (48.9)	37.2 (140.7)	27.9 (105.6)	18.6 (70.4)
20	20.8 (78.8)	15.6 (59.1)	10.4 (39.4)	34.4 (130.3)	25.8 (97.7)	17.2 (65.2)	49.6 (187.6)	37.2 (140.7)	24.8 (93.8)
25	26.0 (98.5)	19.5 (73.8)	13.0 (49.2)	43.0 (162.9)	32.3 (122.2)	21.5 (81.4)	62.0 (234.6)	46.5 (175.9)	31.0 (117.3)
30	31.2 (118.1)	23.4 (88.6)	15.6 (59.1)	51.6 (195.5)	38.7 (146.6)	25.8 (97.7)	74.4 (281.5)	55.8 (211.1)	37.2 (140.7)
35	36.4 (137.8)	27.3 (103.4)	18.2 (68.9)	60.2 (228.0)	45.2 (171.0)	30.1 (114.0)	86.8 (328.4)	65.1 (246.3)	43.4 (164.2)
40	41.6 (157.5)	31.2 (118.1)	20.8 (78.8)	68.8 (260.6)	51.6 (195.5)	34.4 (130.3)	99.1 (375.3)	74.4 (281.5)	49.6 (187.6)
45	46.8 (177.2)	35.1 (132.9)	23.4 (88.6)	77.5 (293.2)	58.1 (219.9)	38.7 (146.6)	111.5 (422.2)	83.7 (316.7)	55.8 (211.1)
50	52.0 (196.9)	39.0 (147.7)	26.0 (98.5)	86.1 (325.8)	64.5 (244.3)	43.0 (162.9)	123.9 (469.1)	92.9 (351.8)	62.0 (234.6)
55	57.2 (216.6)	42.9 (162.5)	28.6 (108.3)	94.7 (358.4)	71.0 (268.8)	47.3 (179.2)	136.3 (516.0)	102.2 (387.0)	68.2 (258.0)
60	62.4 (236.3)	46.8 (177.2)	31.2 (118.1)	103.3 (390.9)	77.5 (293.2)	51.6 (195.5)	148.7 (562.9)	111.5 (422.2)	74.4 (281.5)

Maintenance

Preventive Maintenance Schedule

The operating conditions of the pump determines how often maintenance is required.

Record when and what type of maintenance is needed, then establish a regular schedule for checking the pumps.

No Drip Fluid Module Rebuild Schedule

While the Wolverine ND has been tested and qualified for extended pump life, establishing a yearly rebuild schedule ensures seal and pump performance. See **No Drip Fluid Module Repair**, page 29, for rebuild instructions.

Tighten Threaded Connections

Check that all of the threaded connections are tight at routine intervals.

Tighten Packings

The packings included with the fluid module have the ability to be adjusted to stop leaks that develop when the seals are worn.

If a leak develops in the fluid module, tighten the packing nut clockwise 1/16th of a turn, or lower, until leak is eliminated.

The life of the packing can be affected by over tightening the packings. If the packing nut needs to be tightened repeatedly after short intervals, replace the packing,

Storage

For pumps being stored by long periods, it is recommended that the fluid module be flushed with a light weight oil or rust prohibiter to protect the components. Store the fluid module with the protective fluid inside whenever possible.

Recycling and Disposal

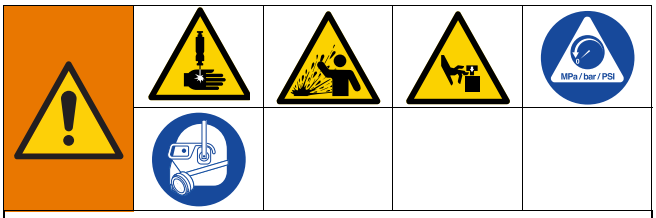
End of Product Life

At the end of the product's useful life, dismantle and recycle it in a responsible manner.

- Perform the **Pressure Relief Procedure**, page 19.
- Drain and dispose of fluids according to applicable regulations. Refer to the material manufacturer's Safety Data Sheet.
- Remove motors, batteries, circuit boards, LCDs (liquid crystal displays), and other electronic components. Recycle according to applicable regulations.
- Do not dispose of batteries or electronic components with household or commercial waste.

- Deliver remaining product to a recycling facility.

Troubleshooting



To reduce the risk of injury due to burns, allow adequate time for the motor to cool before performing any troubleshooting tasks.

Follow **Pressure Relief Procedure**, page 19, before checking or repairing the pump.

NOTE: Check all possible problems and causes before disassembling the pump.

Problem	Cause	Solution
Pump runs, but chemical does not discharge at the correct rate.	Inlet check is clogged with debris (Fluid in calibration column is “bouncing” during calibration)	Remove debris from the check valve. Follow disassembly steps in **Parts**, page 36
	Inlet check o-ring is damaged (Fluid in calibration column is “bouncing” during calibration)	Evaluate o-ring chemical compatibility and replace as required. See page 8 for a link to the chemical compatibility guide. See **Kits and Accessories**, page 42, for check valve repair kits. Follow the directions in **Parts**, page 36.
		Inspect o-rings for signs of mechanical wear (chips, cracks, deformation, etc.), and replace as needed.
	Air in fluid module	Ensure the suction lines are tight and then prime the pump. See **Prime the Pump**, page 19, for the correct priming procedure.
		Injection into a gas line: Inspect the outlet check valve to ensure gas is not back feeding into the fluid module. Repair or replace the check valve if damaged. See **Kits and Accessories**, page 42, for check valve repair kits. the replacement inlet and outlet check valves by seal type and plunger size. Follow the directions in **Parts**, page 36.
	Packing leak	Tighten the packing nut by following the procedure in **Tighten Packings**, page 22. If the leak persists, evaluate packing chemical compatibility and replace. See page 8 for a link to the chemical compatibility guide.
		Inspect the plunger for signs of damage to the coating, scratches in the finish, or any other imperfections. Replace the plunger if damage to the coating or rod exists.
	Inadequate chemical supply	Ensure the chemical tank is filled.
		Inspect and replace the chemical supply filter.
	Incorrect calibration	Ensure the calibration gauge is functioning properly with good venting. Follow the procedure in **Calibrate Chemical Dosage**, page 20. Use the table of **Baseline Chemical Dosage Settings**, page 21, as a reference.

Problem	Cause	Solution
Pump does not stroke	No power	Using a voltage meter or multimeter, ensure the motor has proper incoming power from the power source.
		Ensure a fuse or circuit breaker has not blown or tripped. Replace fuse or reset breaker as needed. If the fuse or circuit breaker trips immediately following power up, first ensure that the correct size of fuse or breaker is installed. Look for potential shorts on the motor leads or circuit boards, if applicable. See **Motor Electrical Connections**, page 17, for the correct circuit protection rating of each motor (fuse or circuit breaker).
		Using a voltage meter or multimeter, ensure the pump controller is supplying power to the motor at the motor leads of the controller.
	Incorrect power	Using a voltage meter or multimeter, ensure the pump power voltage is correct.
		Ensure the pump power polarity is correct. (variable speed DC). See **Motor Electrical Connections**, beginning on page 17 for the wiring directions, or the included manual from the motor manufacturer (12 VDC or 24 VDC variable speed).
	Pump stalled	Ensure the discharge pressure does not exceed the pump's maximum working pressure. Readjust the pressure relief valve to be under the pump maximum working pressure, if it is over.
		Ensure the pressure relief valve is set properly and is functional. Try reducing the set point to see if the pump will turn on.
		Ensure the check valve and shutoff valve at the point of injection are open.
		Ensure the motor shaft spins freely by running the pump with the prime port open. If not, replace motor or gearbox (Gearbox is only replaceable on Hazardous Location (C1D1 and ATEX motors. All other motors have integrated gearboxes, and replacement will consist of a new motor. -For ordinary location and continuous injection see **Wolverine Drive Module for Hazardous Location (C1 D1) and ATEX Pumps**, page 37, for replacement motors (ref. 6e, 6f, and 6g). -For Hazardous Location (C1D1) and ATEX see **Wolverine Drive Module Parts List**, page 38 for replacement gearbox (gear reducer ref. 5). -Follow **Check Valve Repair**, page 30, steps 1-5, and then proceed to remove the four (4) screws holding the motor or gearbox in the drive housing.

Problem	Cause	Solution
Pump does not stroke	Drive cam, motor shaft, or gearbox keyway is damaged	Inspect the keyway for signs of rounded edges or widening of the slot, and replace the motor, gearbox, or cam as required. For ordinary location and continuous injection see **Wolverine Drive Module for Hazardous Location (C1 D1) and ATEX Pumps**, page 37, for replacement motors (ref. 6) and cam (ref. 12). For Hazardous Location (C1D1) and ATEX see **Wolverine Drive Module Parts List**, page 38, for the replacement gearbox (gear reducer ref. 5) and cam (ref. 12).
	Water ingress	Ensure the motor junction box electrical connection and conduit are water-tight. Ensure the plastic conduit seal is properly installed on the outside of the junction box if applicable.
		Inspect the motor and replace as required. Water ingress will damage the motor internals and rust the bearings, causing the motor shaft and internals to seize. See **Wolverine Drive Module for Hazardous Location (C1 D1) and ATEX Pumps**, page 37, and **Wolverine Drive Module Parts List**, page 38, for replacement motors.
	Worn motor brushes (DC only)	Remove brush dust. With the motor removed, follow the process for **Parts**, page 36. Tip the motor on its side and shake out the excess brush dust. Repeat on the other side. Inspect the brushes at this time for excessive wear, and replace them if needed. **NOTE**: Running the pump above rated pressure decreases motor life and results in additional brush wear and dust build up.
		Inspect brushes and replace as required. See **Performance Charts**, page 43, for details
	Motor control board failure (variable speed only)	Inspect the board for damaged or blown components. Incorrect wiring or branch circuit protection, or pressure above maximum rated pressure can damage the circuitry. Replace the control board if damage is noted. See **Kits and Accessories**, page 42, for replacement circuit boards.
	Motor gearbox failure (Motor shaft has excessive side to side movement or rough, gritty feel).	Replace the motor. For ordinary location and continuous injection, see **Wolverine Drive Module for Hazardous Location (C1 D1) and ATEX Pumps**, page 37, for replacement motors (ref. 6).
		Replace the gearbox. (Hazardous Location (C1D1) and ATEX only.) For Hazardous Location (C1D1) and ATEX, see **Wolverine Drive Module Parts List**, page 38, for replacement gearbox (gear reducer reference 5).

Problem	Cause	Solution
Pump is excessively noisy	Worn drive train components	Inspect the stroke adjust blocks for grooves or wear to the stroke adjust shafts. Replace the drive components, as required. Inspect the sleeve bearing in the drive cylinder for ovaling or a loose fit of the stroke adjust shaft. Replace as necessary. Running the pump above the rated pressure can result in excessive wear to the stroke adjust blocks. See **Kits and Accessories**, page 42. Follow the procedure on **Check Valve Repair**, page 30.
	Motor gearbox wear	Replace the motor. For ordinary location and continuous injection, see **Wolverine Drive Module for Hazardous Location (C1 D1) and ATEX Pumps**, page 37, for replacement motors (ref. 6).
		Replace the gearbox. (Hazardous Location (C1D1) and ATEX only.) For Hazardous Location (C1D1) and ATEX, see **Wolverine Drive Module Parts List**, page 38. for replacement gearbox (gear reducer ref. 5).
Chemical leaking from packing	Worn packing	Tighten the packing nut by following the procedure in **Tighten Packings**, page 22. If the leak persists, replace the packing or plunger, as necessary. (The packing nut is set from the factory and does not require tightening when first installed.)
		Chemical compatibility: Consult the seal selection guide to ensure the seal in use is designed to operate with the chemicals being pumped. See page 8, for a link to the chemical compatibility guide.
		Temperature: Consult the seal selection guide to ensure the seal in use is designed to operate in the recommended temperature range. See page 8, for a link to the chemical compatibility guide.
		Plunger coating: Inspect the plunger for coating failure due to chemical or abrasive attack (flaking of coating, scratches, wear through). Replace as required. If the plunger is uncoated, inspect for scratches due to abrasion, or breakdown due to chemical attack. Replace as required. See **Kits and Accessories**, page 42, for replacement fluid plungers.

Repair

Disconnect Fluid Module

The numbers used are referenced from **Wolverine Fluid Module**, page 39.

1. Follow the **Pressure Relief Procedure**, page 19.
2. Expose the packing nut (210) by loosening the dust shield (226) and sliding it towards the bleed valve (214).

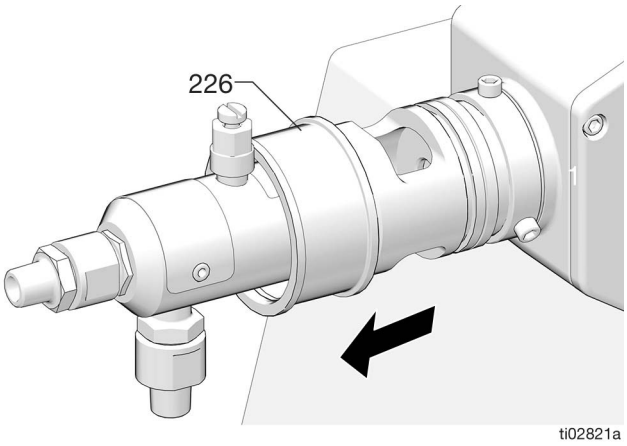


FIG. 9: Remove dust shield

3. Loosen, but do not remove, packing nut (210) using a 5/32 in. hex key.

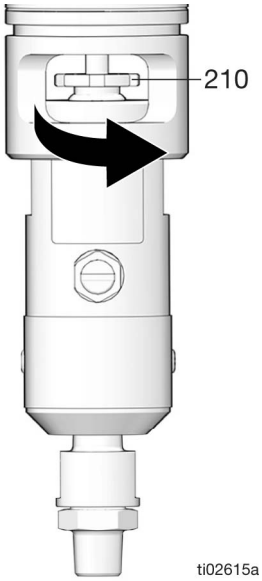


FIG. 10

4. Rotate the fluid cylinder (201) to loosen, and pull off of the plunger (213).

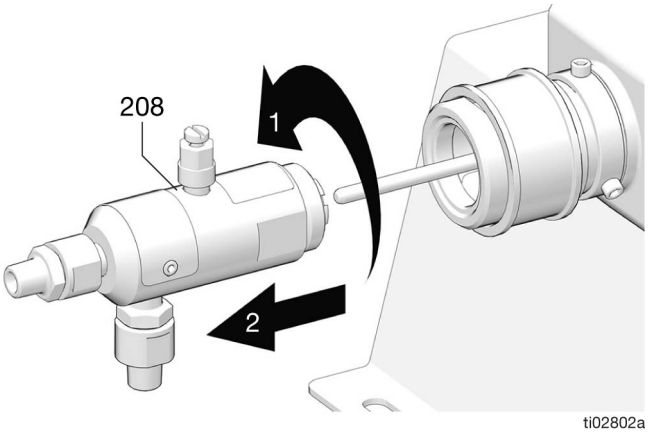


FIG. 11: Disconnect Wolverine Advanced and Hazardous Location Drive Module

If the plunger (213) is damaged:

5. Remove the three screws (228) and slide off the adapter (224).

6. Lift and remove the plunger (213) from the drive module (see FIG. 11, page 27).

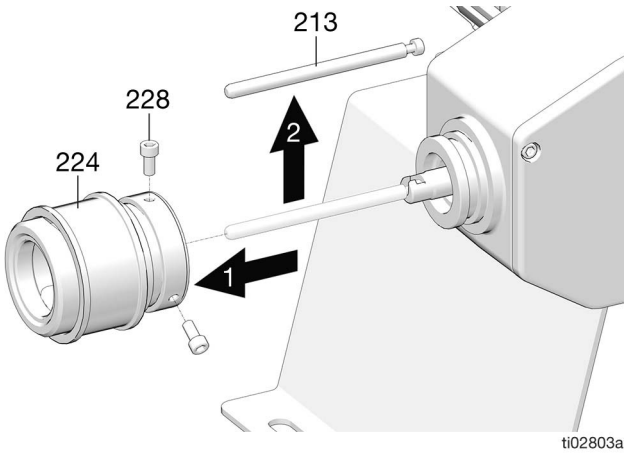


FIG. 12: Disconnect plunger from drive shaft

Fluid Module Repair

1. Remove packing nut (210) from the fluid cylinder (201) with a 5/32 in. hex key (FIG. 13).
2. Remove the bearings (203)
3. Remove the packings (204 to 208).
4. Replace the packings (204 to 208) and bearings (203). Lubricate the packings prior to reassembly (FIG. 13 and FIG. 14).

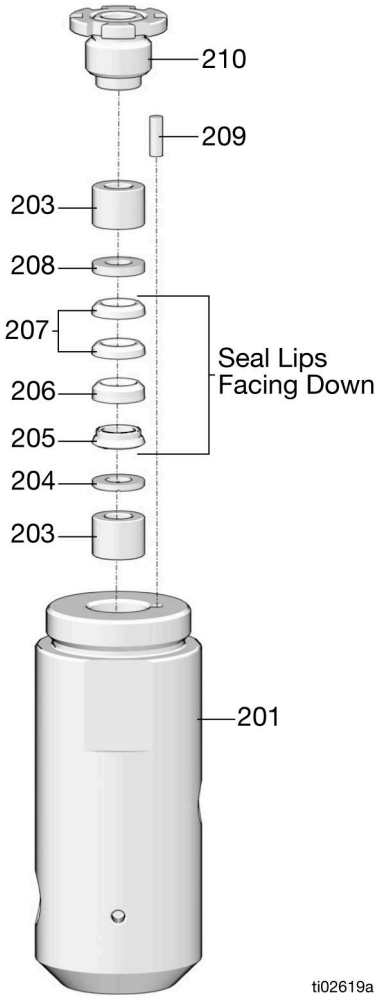


FIG. 13: Wolverine Fluid Module Repair

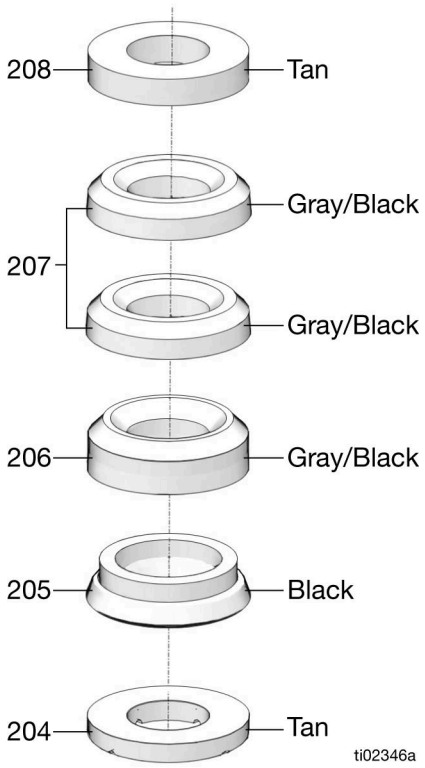


FIG. 14: Packing (206) detailed view

5. Reinstall the packing nut (210).
6. Set the height of the packing nut (210 with a hex key to .156 in. (4.0 mm) (FIG. 15).

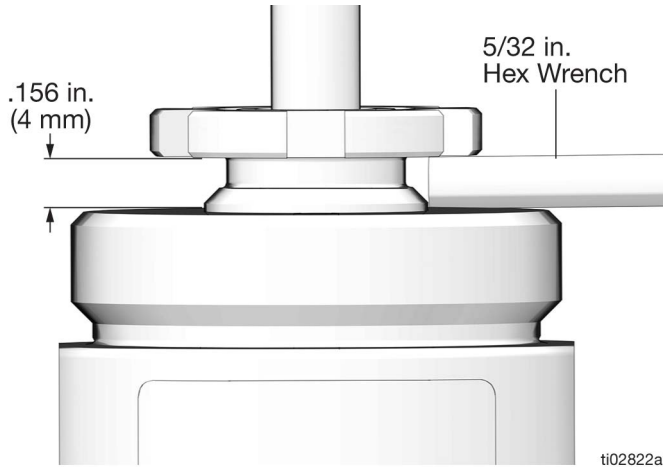


FIG. 15:

No Drip Fluid Module Repair

1. Remove packing nut (210) from fluid cylinder (201) with a 5/32 in. hex key (FIG. 16)
2. Use a socket or flat punch to press out the packing assembly.
3. Replace both packings (204 to 208) and bearings (203). Inspect spacer (202) and replace, if necessary. Lubricate prior to reassembly. Replace both packings as a pair (FIG. 16 and FIG. 17)
4. Replace both of the o-rings (211) and both back-up ring (212) on the outside of the packing nut (210). Lubricate prior to reassembly. Replace both sets as a pair (FIG. 16).

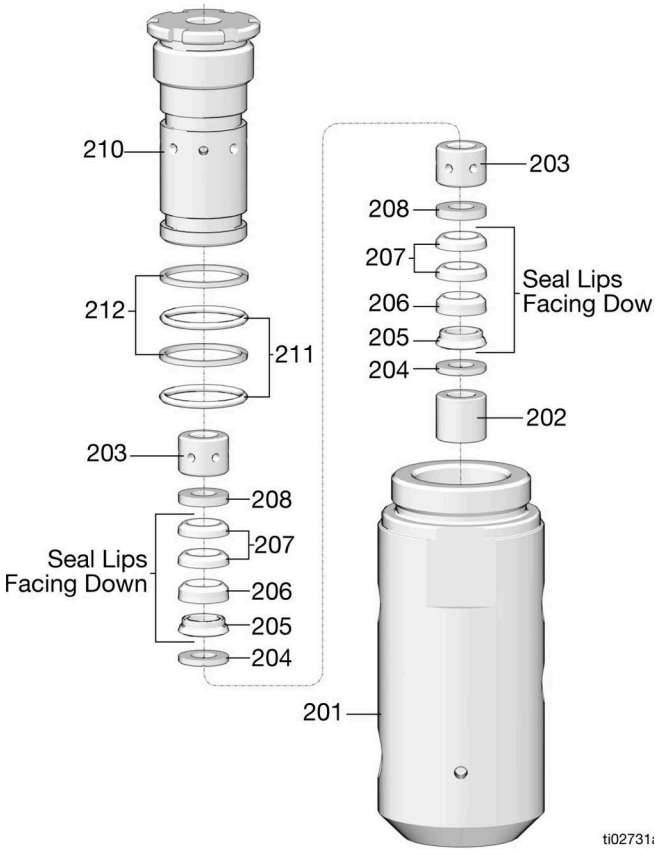


FIG. 16: Wolverine No Drip Fluid Module Repair

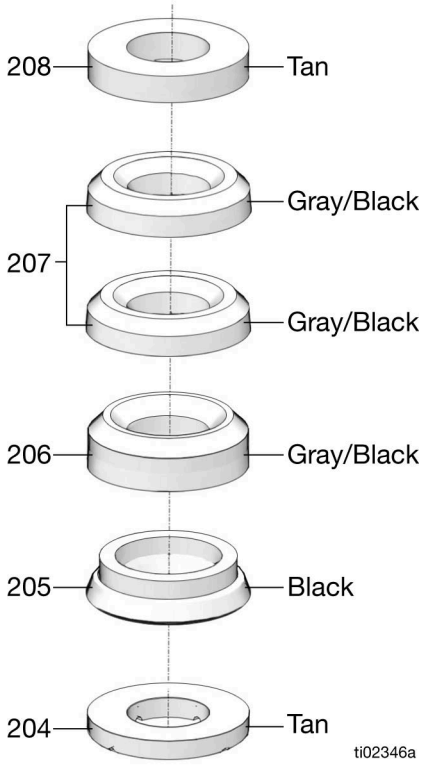


FIG. 17: Packing (306) detailed view

5. Reinstall the packing nut (210).
6. Set the height of the packing nut (210 with a hex key to .156 in. (4.0 mm) (FIG. 18).

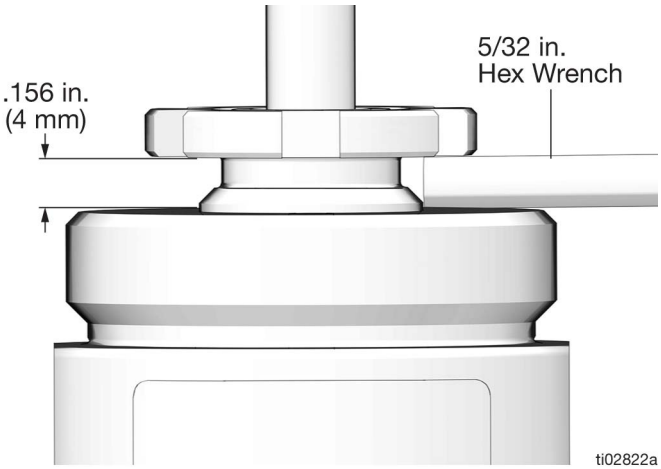


FIG. 18:

Check Valve Repair

The following procedures apply to the check valves on Wolverine Advanced and Wolverine Hazardous Location pumps.

Inlet Check Valve

1. Follow the **Pressure Relief Procedure**, page 19.
2. Remove the inlet check valve assembly (216). For No Drip fluid models, begin disassembly with removing the hose (220) from the swivel (219). Remove the inlet check valve assembly (216), the tee fitting (218), and the swivel (219) as a complete assembly.
3. Remove the top piece of the inlet check valve (216d) and piston (216c) (FIG. 19).

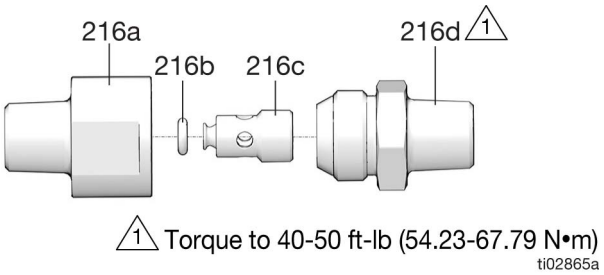


FIG. 19:

4. Remove the piston o-ring (216b) from the piston (216c).
5. Inspect parts for wear, and replace as needed.
6. Install the piston o-ring (216b).
7. Reassemble the piston (216c) and the top piece of the inlet check valve (216d). Torque the top piece to 40-50 ft-lb (54.2 - 67.8 N•m).
8. Reconnect the inlet check valve assembly (216). Apply sealant to the exterior threads of the valve assembly.
9. Reconnect and tighten fluid lines.
10. **Prime the Pump**, page 19.
11. If necessary, **Calibrate Chemical Dosage**, page 20.

Outlet Check Valve

1. Follow the **Pressure Relief Procedure**, page 19.
2. Remove the outlet check valve assembly (217).
3. Remove the top piece of the outlet check valve (217e), spring (2167d), and piston (217c) (FIG. 20).

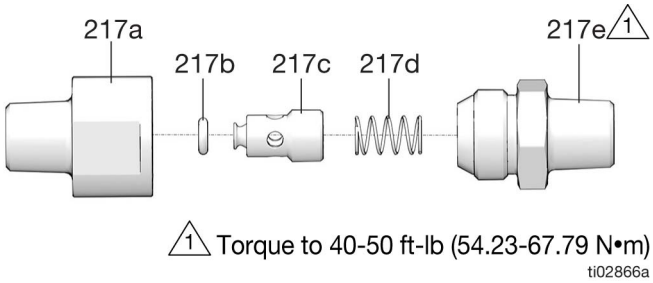


FIG. 20:

4. Remove the piston o-ring (217b) from piston (217c).
5. Inspect parts for wear and replace, as needed.
6. Install the piston o-ring (217b).
7. Reassemble the piston (217c), spring (217d), and the top piece of the outlet check valve (217e). Torque the top piece to 40-50 ft-lb (54.2 - 67.8 N•m).
8. Reconnect the outlet check valve assembly (217). Apply sealant to the exterior threads of the valve assembly.
9. Reconnect and tighten fluid lines.
10. **Prime the Pump**, page 19.
11. If necessary, **Calibrate Chemical Dosage**, page 20.

Reconnect Fluid Module

If the plunger was not removed during disassembly:

1. Lubricate the plunger (213).
2. Push the fluid cylinder (201) onto the plunger (213) and rotate the fluid cylinder (201) to tighten (FIG. 21).

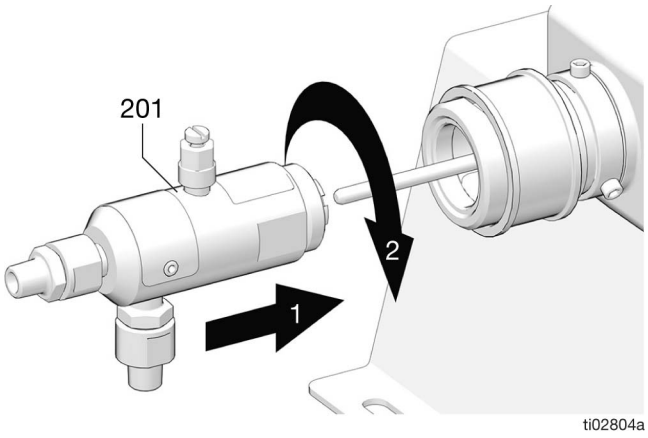


FIG. 21

3. Tighten the packing nut housing (210) (FIG. 22).

FIG. 22: Tighten packing nut

4. Set the height of the packing nut (210) with a hex key to .156 in. (4.0 mm) (FIG. 23).

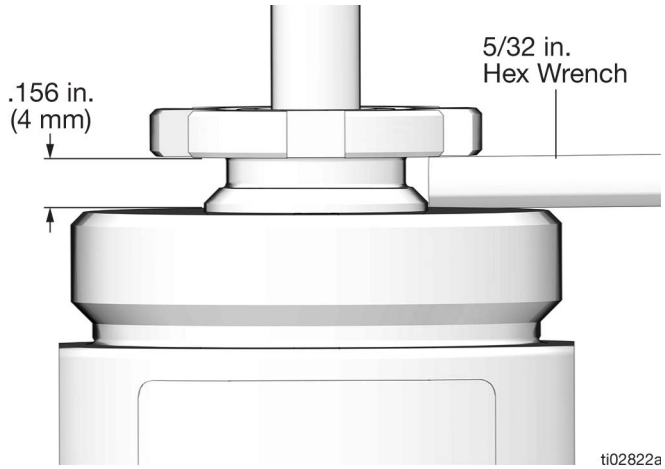


FIG. 23:

5. Reconnect inlet and outlet fluid lines to the fluid module.
6. Reconnect power to the motor.
7. **Prime the Pump**, page 19.
8. If necessary, **Calibrate Chemical Dosage**, page 20.
9. Tighten packing nut as necessary to seal fluid module plunger.
10. Slide the dust shield (226) over the packing nut (210) toward the bleed valve (214).

If the plunger was removed during disassembly:

1. Reconnect the fluid module plunger (213) to the drive module (3a) (FIG. 24).
2. Replace the plunger (213) into the drive module (FIG. 24).

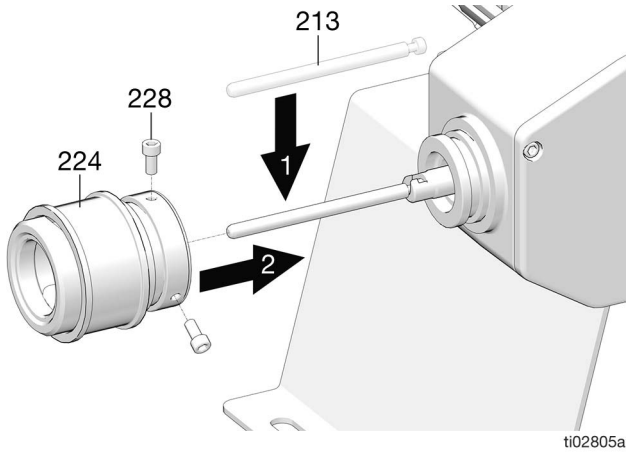


FIG. 24

3. Lubricate the plunger (213).
4. Slide the adapter (224) onto the plunger (213) and insert the three screws (228).
5. Verify the set screws (228) are in the groove of the drive adapter (224) and torque the set screws to 20-30 in-lb (2.3 - 3.4 N•m). (FIG. 25).

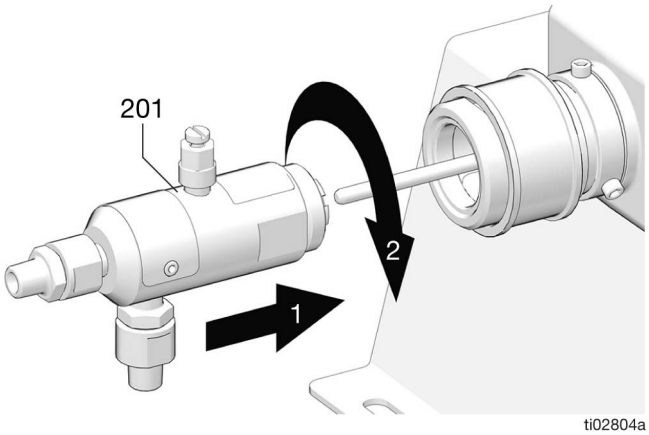


FIG. 25:

6. Tighten the packing nut (210) using a 5/32 in. hex key (FIG. 26).

FIG. 26: Tighten packing nut

7. Set the height of the packing nut (210) with a hex key to .156 in. (4.0 mm) (FIG. 27).

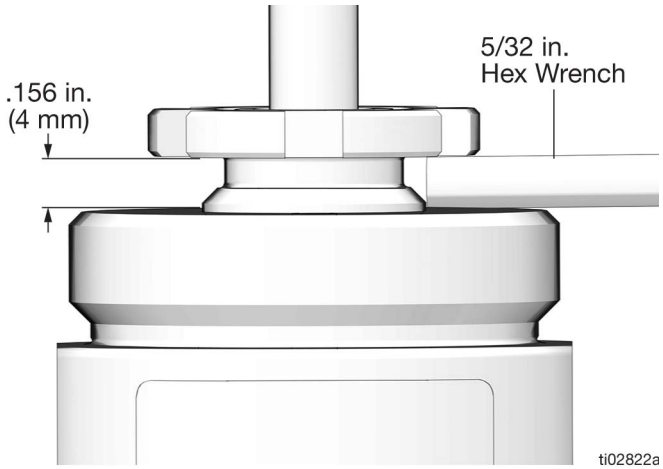


FIG. 27:

8. Reconnect inlet and outlet fluid lines to the fluid module.
9. Reconnect power to the motor.
10. **Prime the Pump**, page 19.
11. If necessary, **Calibrate Chemical Dosage**, page 20.
12. Tighten packing nut as necessary to seal fluid module plunger.
13. Slide the dust shield (226) over the packing nut (210) toward the bleed valve (214).

Drive Module Repair

Disassemble

1. Disconnect the Fluid Module, see **Disconnect Fluid Module**, page 27.
2. Remove the two screws (24).
3. Remove the housing drive guard (23).
4. Use two hex keys to rotate the cam (12) of the shaft key (15) is in the down position (FIG. 28).

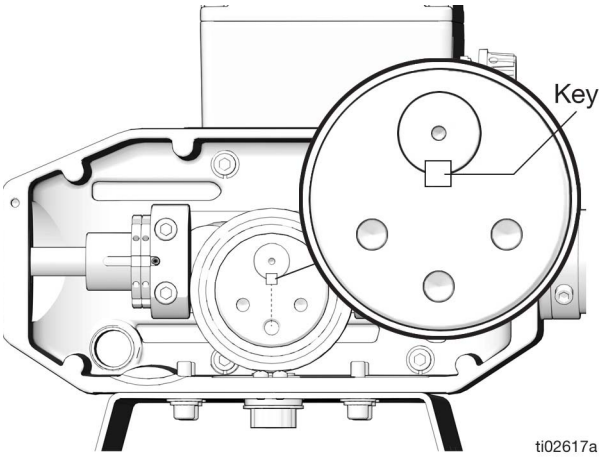


FIG. 28:

5. Remove the red plug from the bottom of the housing (26) and use a 3/16 in. hex key to remove the set screw on the bottom rear of the cam (12) (FIG. 29).

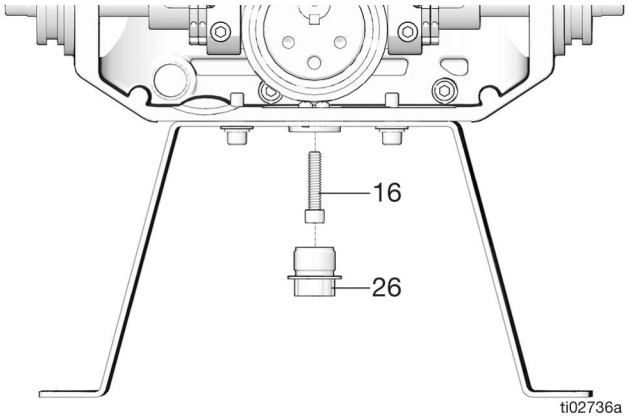


FIG. 29:

6. Remove the cam (12) from the motor shaft (FIG. 30).

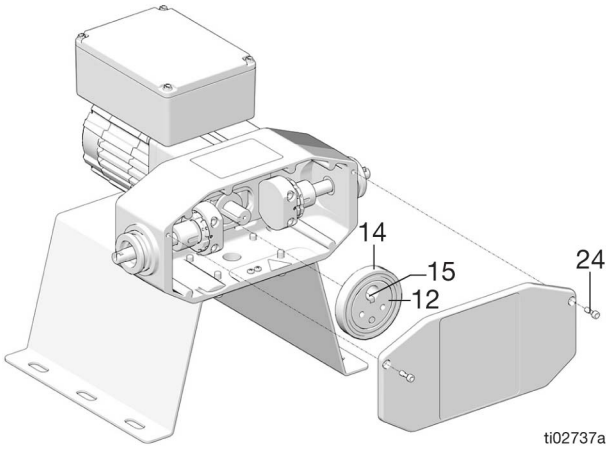


FIG. 30:

7. Remove the four bolts (8) and washers (7) at the back of the housing (FIG. 31).

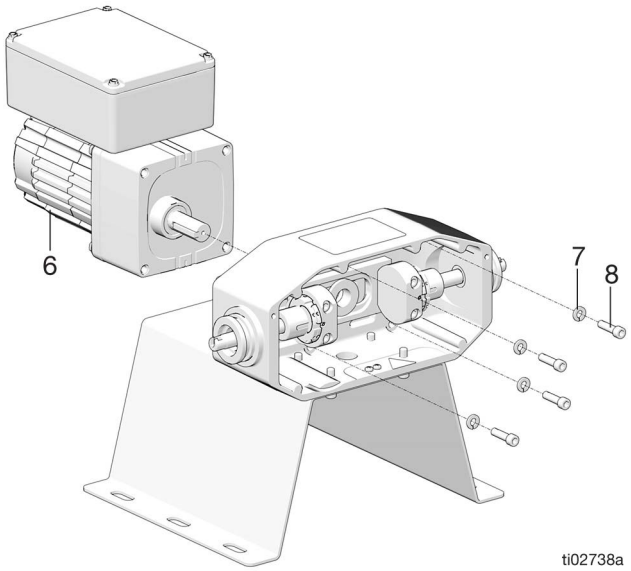


FIG. 31:

8. Remove the motor (6).
9. Remove stroke adjuster screws (11) (FIG. 32).

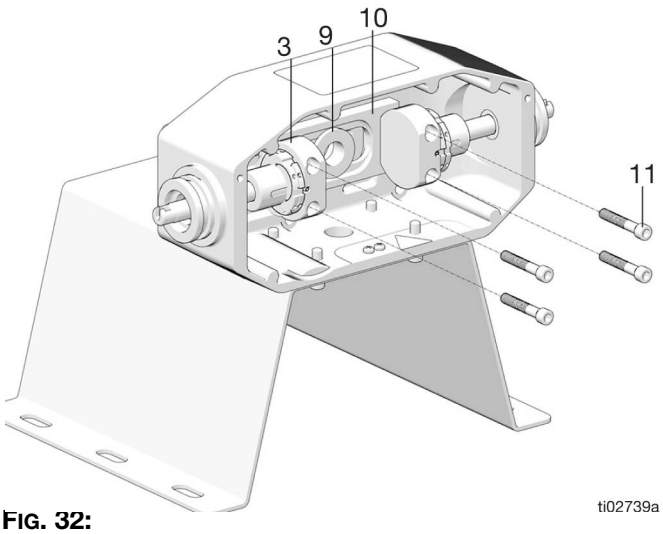


FIG. 32:

10. Slide the stroke adjusters (3) toward the center and pull out (FIG. 33).

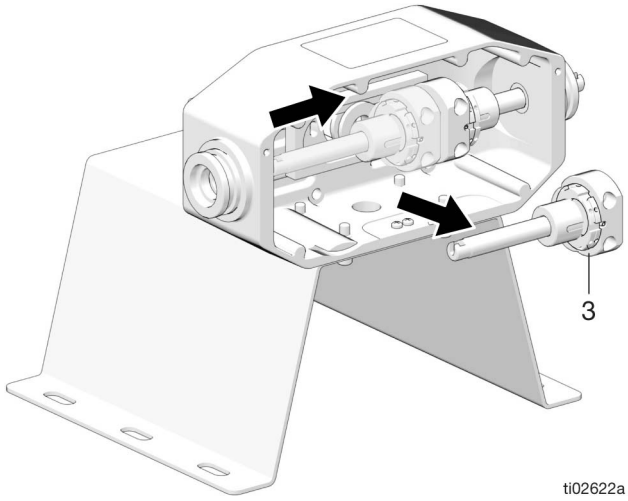


FIG. 33:

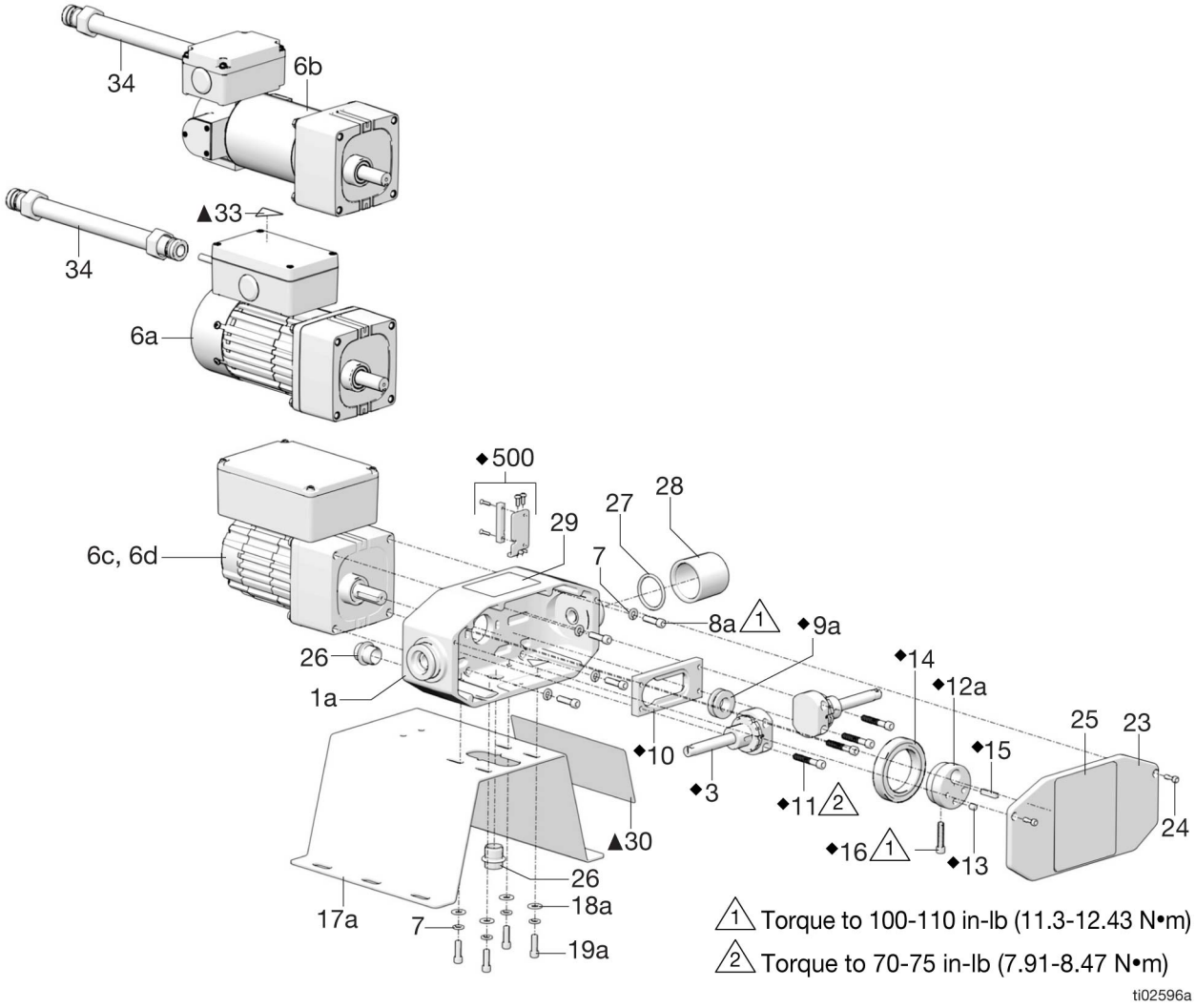
Reassemble

NOTE: It is best practice to use all of the parts in the kit.

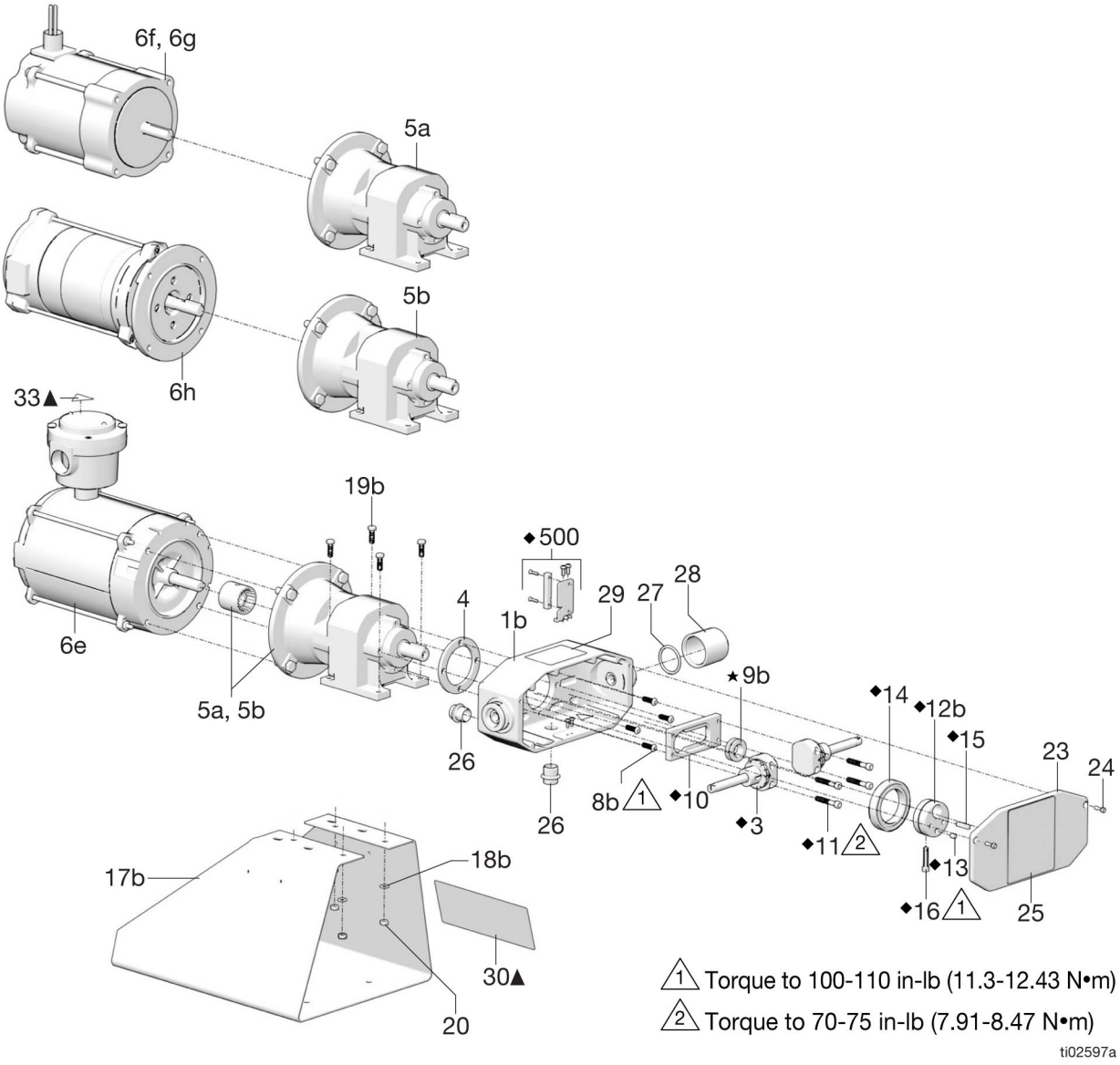
1. Replace the stroke adjusters (3). Kit P/N B33308 and B33309.
2. Insert the stroke adjusters (3).
3. Position and place the motor (5).
4. Place the four washers (7) and bolts (8) at the back of the housing and tighten.
5. Replace and position the carriage bearing (9) into the new carriage (10).
6. Replace the carriage bearing (9). Kit P/N B33308 and B33309.
7. Lubricate the carriage bearing (9).
8. Insert the new carriage (1) over the motor shaft.
9. Place the new cam (12) into place and tighten the screw, torque to 100 - 110 in. lb. (11.3 - 12.4 N•m).
10. Lubricate the cam bearing (14).
11. Slide the stroke adjusters (3) into place.
12. Reinstall the stroke adjuster screws (11) and tighten to 70 - 75 in. lb. (7.9 - 8.5 N•m).
13. Replace the housing drive guard.
14. Reinstall the two screws (24) and tighten.
15. Reconnect the fluid module, see **Reconnect Fluid Module**, page 32.

Parts

Wolverine Drive Module for AC, DC, and Continuous Injection Pumps (C1 D2)



Wolverine Drive Module for Hazardous Location (C1 D1) and ATEX Pumps



Wolverine Drive Module Parts List

Ref.	Part	Description	Qty
1a		HOUSING, drive, std	1
1b		HOUSING, drive, haz loc	1
2		BEARING, sleeve	2
3†★		ADJUST, stroke assy	2
4		SPACER, gear, rdcr, haz loc	1
5a		GEAR, reducer, dbl reduction, 24.75:1	1
5b		GEAR, reducer, dbl reduction, 21.38:1	1
6a		MOTOR, 115 VAC, 150 in. lb, 1.5 HP	1
6b		MOTOR, 12V, 150 in. lb, 1.5 HP	1
6c		MOTOR, 12V, brushless, variable speeds, C1 D2, 150 in. lb, 1.5 HP	1
6d		MOTOR, 24V, brushless, variable speed, C1 D2	1
6e		MOTOR, 115/230V, 1/4 HP, haz Loc	1
6f		MOTOR, 12V, 1/5 HP, haz Loc	1
6g		MOTOR, 12V, 1/5 HP, haz loc	1
6h		MOTOR, 230 VAC, Atex	1
7		WASHER, lock spring	8
8a		SCREW, shc, 1/4 - 28 x .875, sst	4
8b		SCREW, bhc, M6 x 20 mm, sst	4
9a†		BEARING, CIP carriage, .625 shaft	1
9b★		BEARING, CIP CARRIAGE, .750 SHAFT	1
10†★		CARRIAGE, plg rtn, 1/4 - 20 holes	1
11†★		FASTENERS, SHCS, 1/4 - 20 c 1.5, sst	4
12a†		CAM, eccentric, CIP, .625 shaft	1
12b★		CAM, eccentric, CIP, .750 shaft	1
13†★		MAGNET, reed sensor	1
14†★		BEARING, deep grv ball	1
15†★		KEY, sst, 188 square x .875	1
16†★		FASTENER, SHCS, 1/4 - 20 x 1.125	1
17a		BASE, motor, std	1
17b		BASE, motor, haz loc	1
18a		WASHER, lock, spring 1.4	4
18b		WASHER, flat, M6	4
19a		SCREW,shc,1/4-20 x .75	4
19b		SCREW, cap,hex hd,M6 x 20	4
20		NUT, hex, M6	4
21		SCRW, php,6-32 x .375 sst	2
22▲	15H108	LABEL, pinch hazard	1
23		GUARD, housing, drive	1
24		SCREW, self contain,10-24 x .530	2
25		LABEL, product	1
26		CAP PLUG,threaded,1/2 NPT	2
27		O-RING,BUNA,220	1
28		COVER, simplex, molded, Wolverine	1
29▲	2007140	LABEL, max working pressure, fluid head	1
30▲	17G318	LABEL, warning	1
31		PLATE, designation	1
32		RIVET	2
33▲	15G303	LABEL, warning, electric shock	1
34		CONDUIT, wire	1
500◆		KIT, cycle Count	1

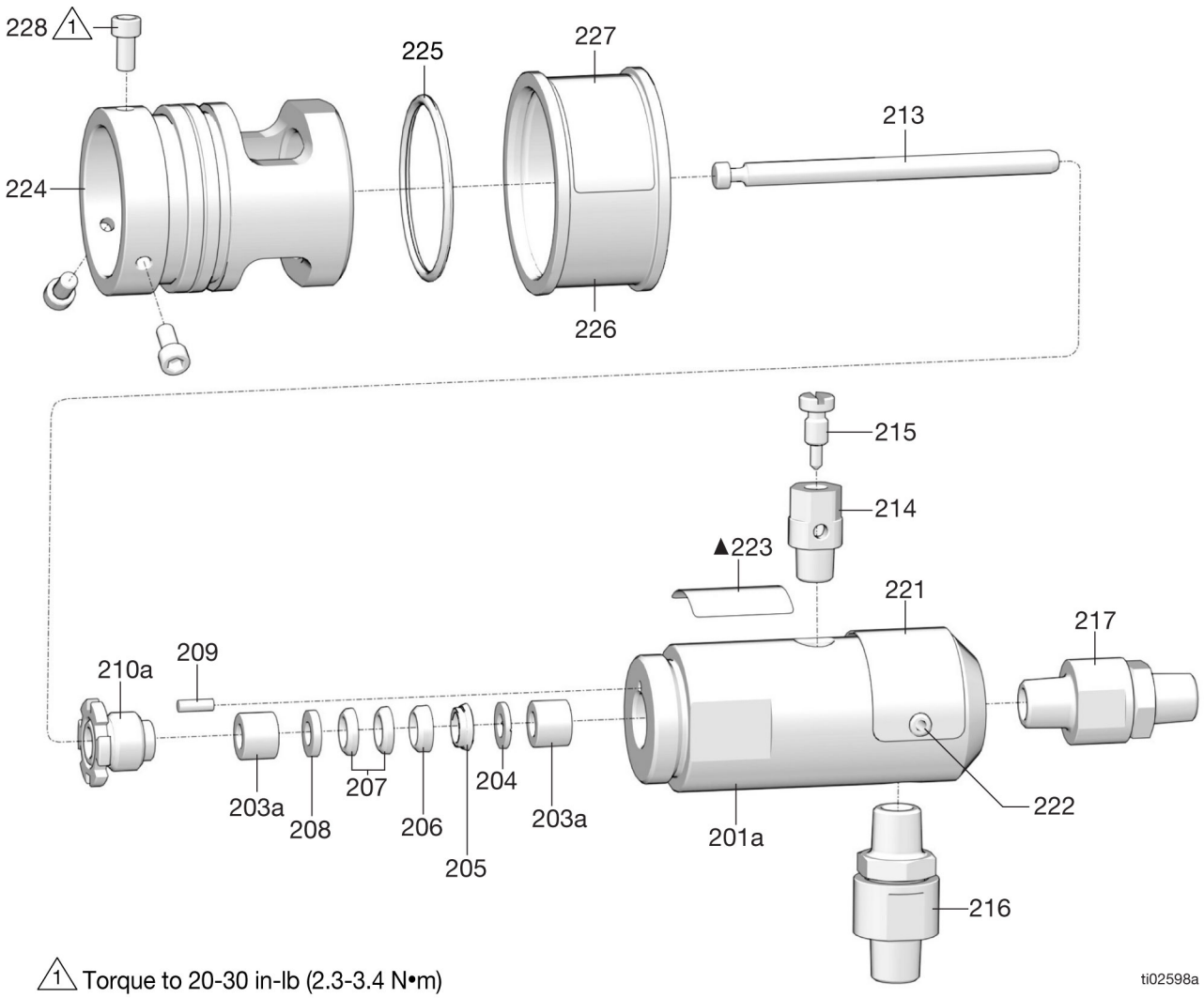
▲ *Replacement safety labels, tags, and cards are available at no cost.*

† *Included in Standard Motor Drive Module Rebuild Kit, see* ***Kits and Accessories****, page 42.*

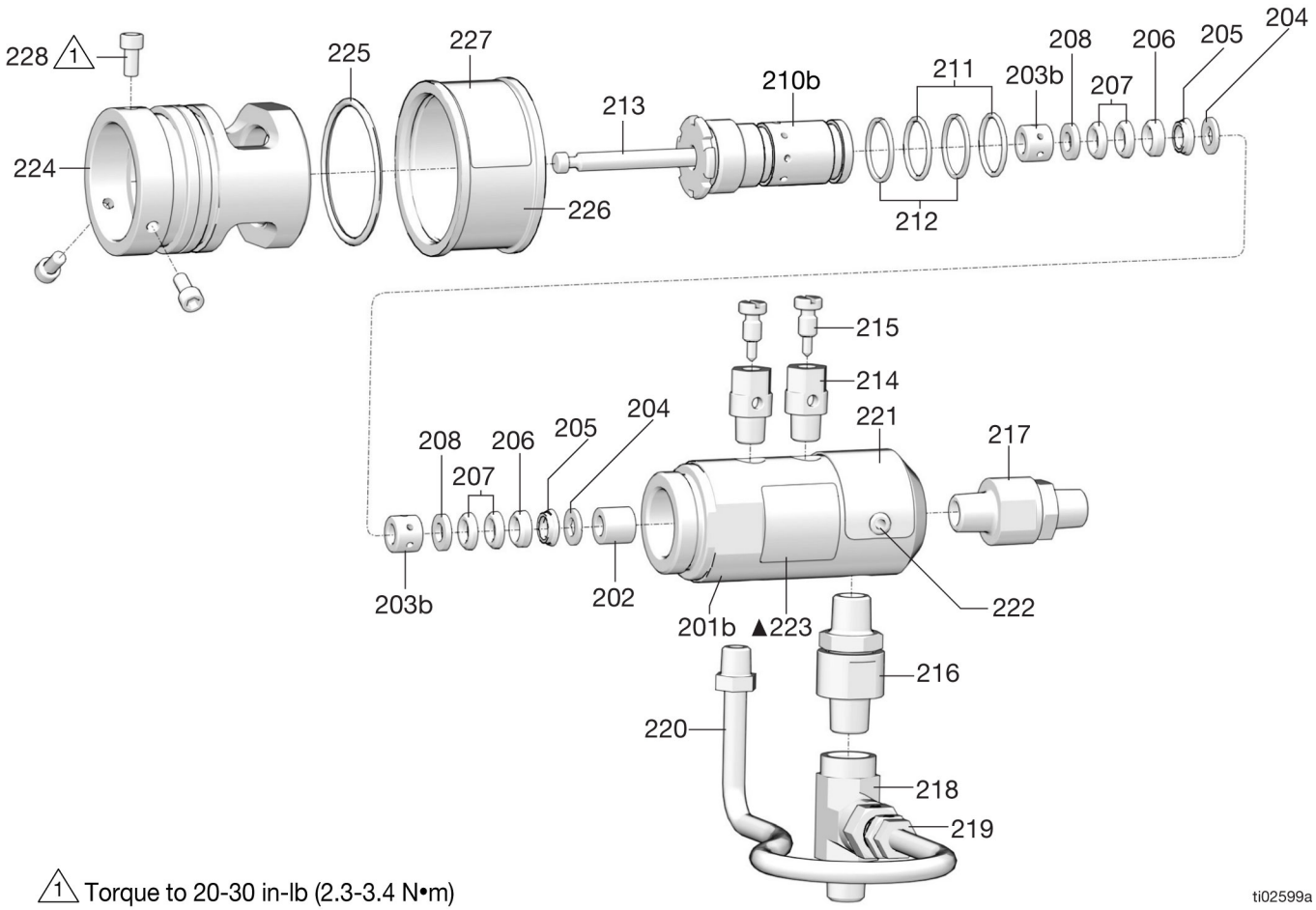
★ *Included in Hazard Location Motor Drive Module Rebuild Kit, see* ***Kits and Accessories****, page 42.*

◆ *Included in Cycle Count Kit, see* ***Kits and Accessories****, page 42.*

Wolverine Fluid Module



No Drip Wolverine Fluid Module



1 Torque to 20-30 in-lb (2.3-3.4 N•m)

ti02599a

Wolverine Fluid Module Parts List

Ref.	Part	Description	Qty
201a		CYLINDER, fluid, std	1
201b		CYLINDER, fluid, no drip	1
202‡		SPACER, plunger, no drip	1
203a‡		BEARING, plunger, std	2
203b‡		BEARING, plunger, no drip	2
204‡		RING, hat, seal, std head	1
		NO DRIP	2
205‡		SEAL, z-lip, std head	1
		NO DRIP	2
206‡		BASE, seal, z-lip, std head	1
		NO DRIP	2
207‡		RING, vee, z-lip, std head	2
		NO DRIP	4
208‡		RING, female, z-lip, std head	1
		NO DRIP	2
209		PELLET, nylon	1
210a		NUT, packing, std	1
210b		NUT, packing, no drip	1
211‡		O-RING, nut, packing, no drip	2
212‡		BACKER, o-ring, nut, packing, no drip	2
213⁜		PLUNGER, fluid	1
214❖		HOUSING, bleed valve, std head	1
		NO DRIP	2
215❖		NEEDLE, valve, bleed, std head	1
		NO DRIP	2
216✿		VALVE, check, inlet	1
217✿		VALVE, check, outlet	1
218		FITTING, tee, 1/4 NPT m x m x f, sst	1
219		FITTING, swivel, 1/4 NPT, sst	1
220		HOSE, recapture, sst	1
221		PLATE, designation	1
222		RIVET	2
223▲	2006480	LABEL, warning, injection, std head	1
		NO DRIP	2
224		ADAPTER, module, fluid	1
225		O-RING, buna	1
226		SHIELD, dust	1
227		LABEL, nut, packing	1
228		SCREW, SHC,10-32 x .38, sst	3

▲ *Replacement safety labels, tags, and cards are available at no cost.*

‡ *Included in Seal Rebuild Kits, see* ***Kits and Accessories****, page 42.*

⁜ *Included in Plunger Replacement Kits, see* ***Kits and Accessories****, page 42.*

❖ *Included in Bleed Kit, see* ***Kits and Accessories****, page 42.*

✿ *Included in Check Valve Kits, see* ***Kits and Accessories****, page 42.*

Kits and Accessories

Drive Module Kits

Part No.	Description
B33308	KIT, rebuild, module, drive, motors, std
B33309	KIT, rebuild, module, drive, motors, haz loc
B33310	KIT, adapter, wolverine, for models prior to November 2024
B32479	Cycle Count Accessory (ordinary location only)

Fluid Module Kits

Part No.	Description
B33306	KIT, plunger, Wolverine, chromex, 63
B33307	KIT, plunger, Wolverine, chromex, 75
B32061	KIT, plunger, 1/4, elec, chromex
B32062	KIT, plunger, 3/8, elec, chromex
B32063	KIT, plunger, 1/2, elec, chromex
B33029	KIT, plunger, 3/8, izory hd
B33030	KIT, plunger, 1/2, izory hd
B33031	KIT, plunger, 5/8, izory hd
B33076	KIT, plunger, CIP, 38, bare

Standard Seal Packing Kits

Part No.	Description
2B32437	KIT, rpr, packing, 25, FKMETP
2B32438	KIT, rpr, packing, 38 FKMETP
2B32439	KIT, rpr, packing, 50 FKMETP
2B32440	KIT, rpr, packing, 63 FKMETP
2B32441	KIT, rpr, packing, 75 FKMETP
2B32444	KIT, rpr, packing, 25 HNBR
2B32445	KIT, rpr, packing, 38 HNBR
2B32446	KIT, rpr, packing, 50 HNBR
2B32447	KIT, rpr, packing, 63 HNBR
2B32448	KIT, rpr, packing, 75 HNBR
2B32451	KIT, rpr, packing, 25 FFKM
2B32452	KIT, rpr, packing, 38 FFKM
2B32453	KIT, rpr, packing, 50 FFKM
2B32454	KIT, rpr, packing, 63 FFKM
2B32455	KIT, rpr, packing, 75 FFKM

No Drip Seal Packing Kits

Part No.	Description
2B33201	KIT, rpr, packing, ND, 25 FKM/ETP
2B33202	KIT, rpr, packing, ND, 25 HNBR
2B33203	KIT, rpr, packing, ND, 25 FFKM
2B33204	KIT, rpr, packing, ND, 38 FKM/ETP
2B33205	KIT, rpr, packing, ND, 38 HNBR
2B33206	KIT, rpr, packing, ND, 38 FFKM
2B33207	KIT, rpr, packing, ND, 50 FKM/ETP
2B33208	KIT, rpr, packing, ND, 50 HNBR
2B33209	KIT, rpr, packing, ND, 50 FFKM

Check Valve and Bleed Valve Kits

Part No.	Description
B33300	KIT, valves, check, in/out, FKM ETP
B33301	KIT, valves, check, in/out, HNBR
B33302	KIT, valves, check, in/out, FFKM
B33303	KIT, valves, check, in/out, FFKM,T12 coated
B33304	KIT, bleed, T12
B32191	KIT, bleed

Performance Charts

Wolverine Advanced Pumps

1/4 in. Plunger

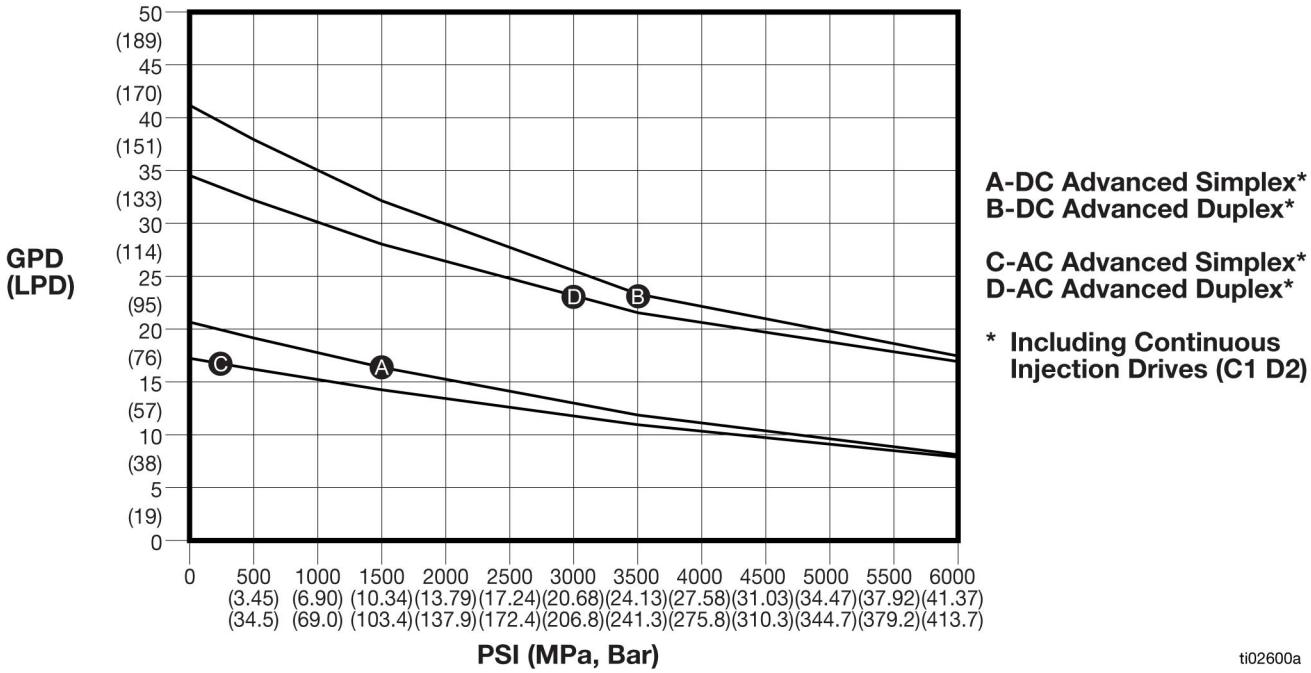


FIG. 34

3/8 in. Plunger

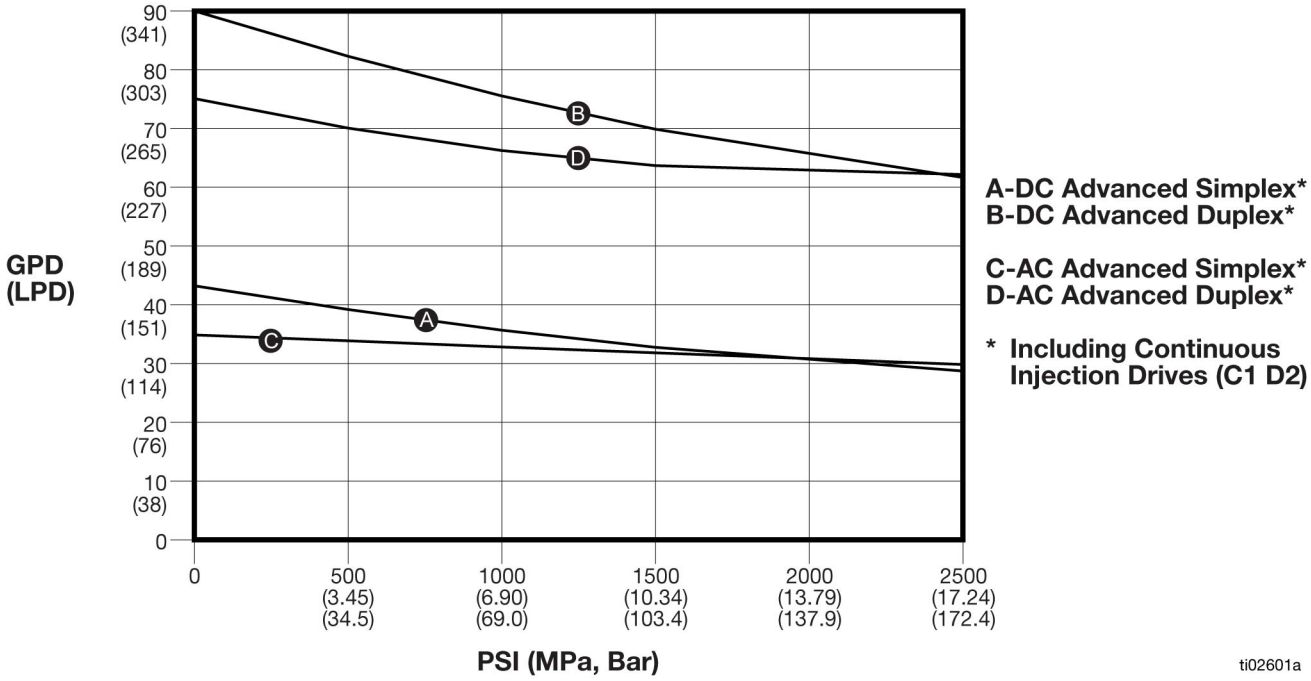


FIG. 35

1/2 in. Plunger

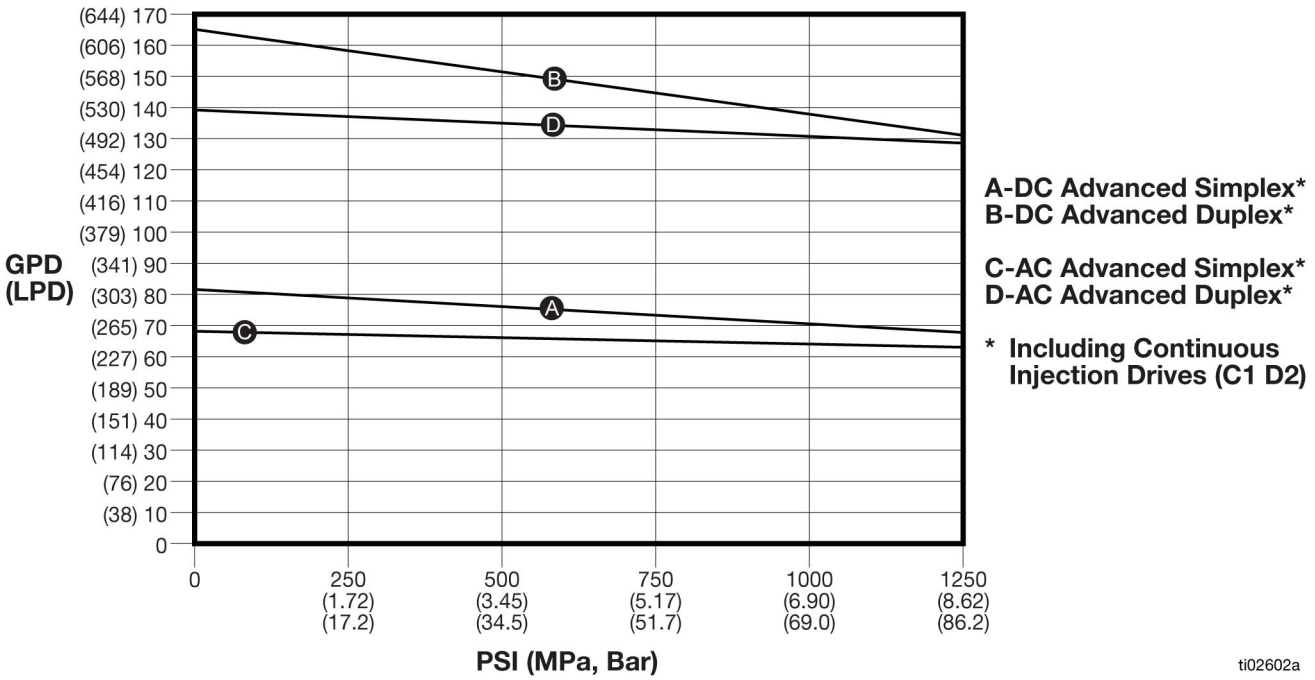


FIG. 36

5/8 in. Plunger

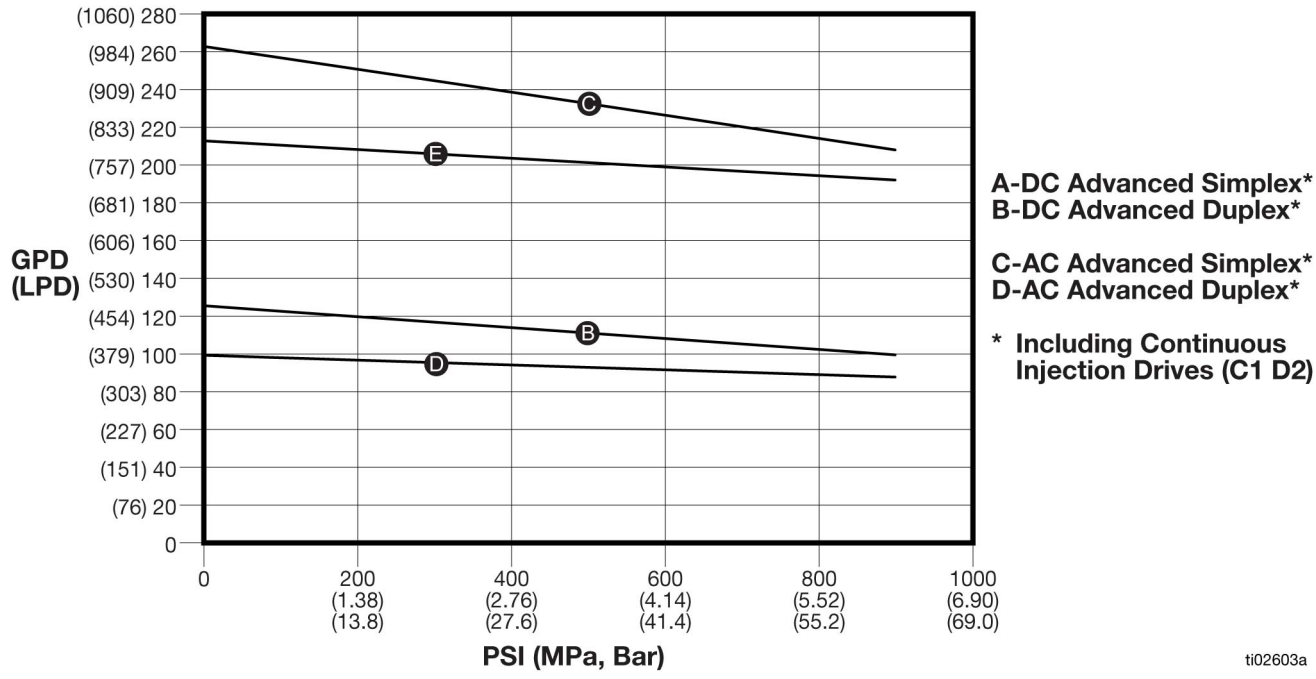


FIG. 37

3/4 in. Plunger

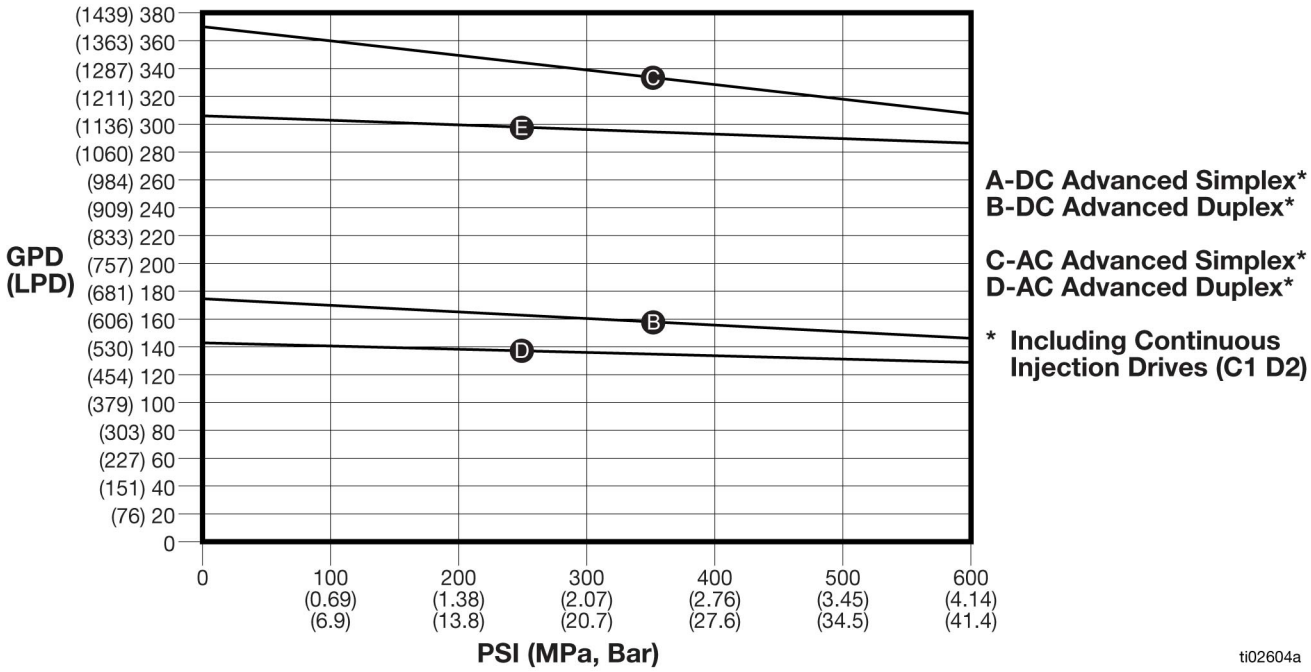


FIG. 38

Wolverine Hazardous Location Pumps (C1 D1) and ATEX

1/4 in. Plunger

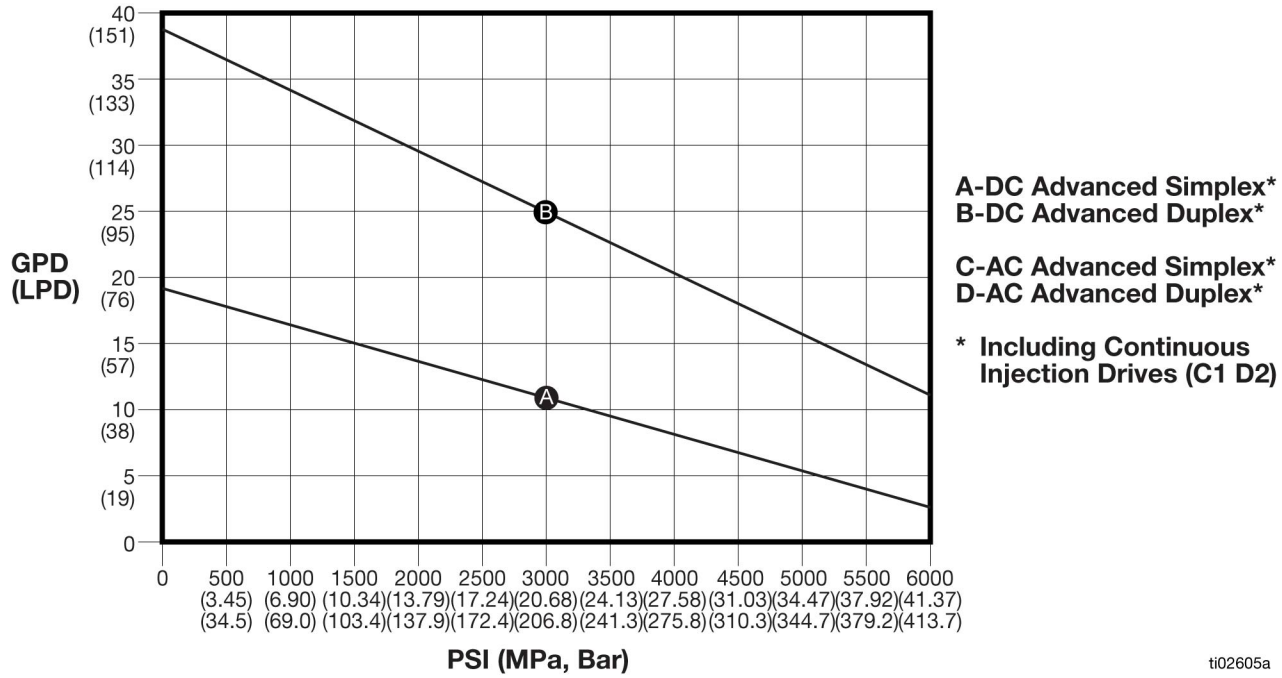


FIG. 39

3/8 in. Plunger

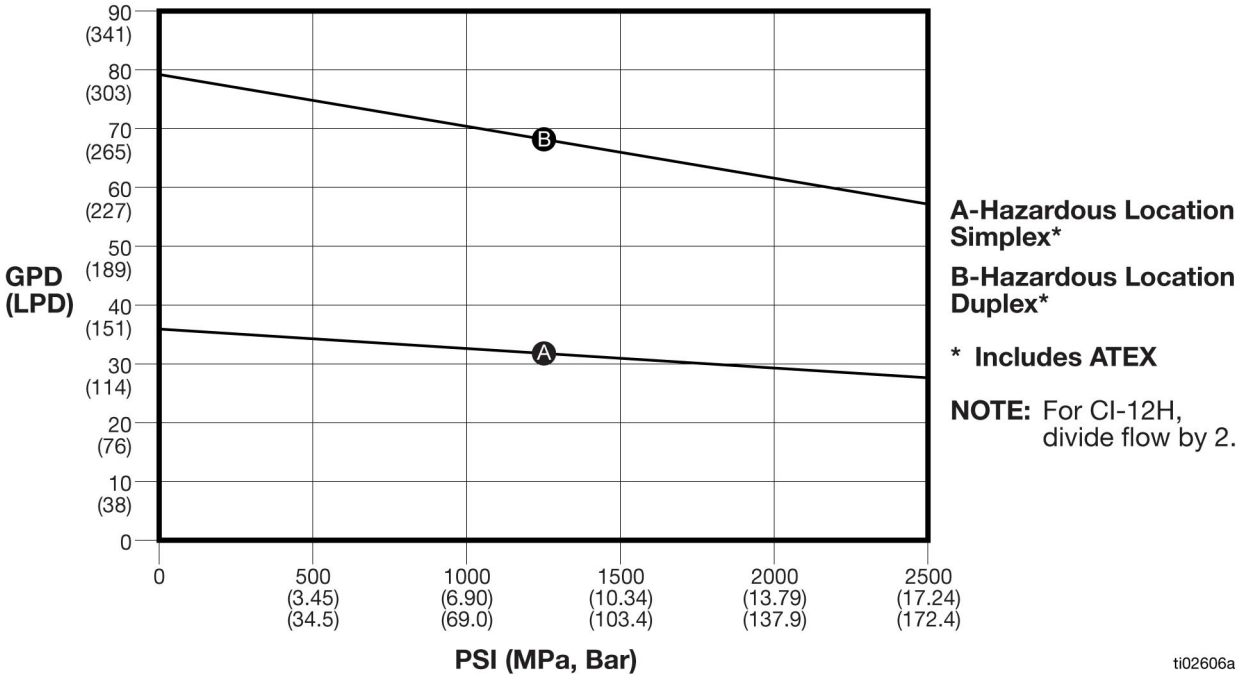


FIG. 40

1/2 in. Plunger

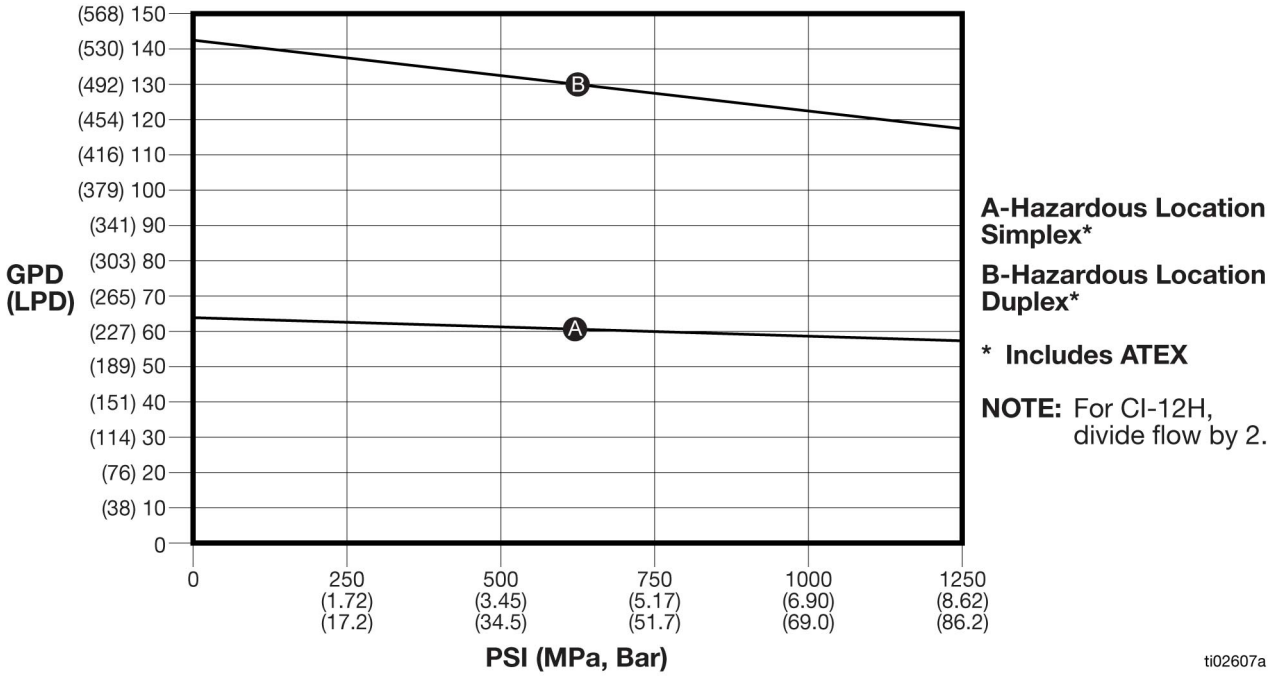


FIG. 41

5/8 in. Plunger

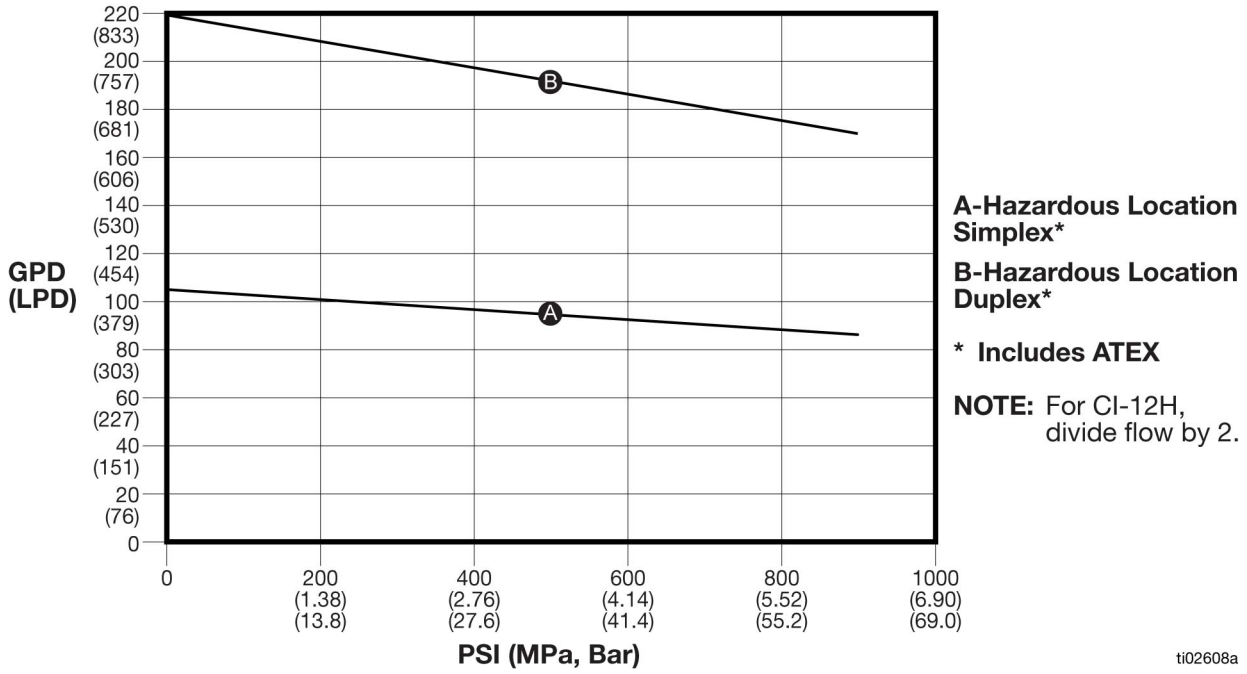


FIG. 42

3/4 in. Plunger

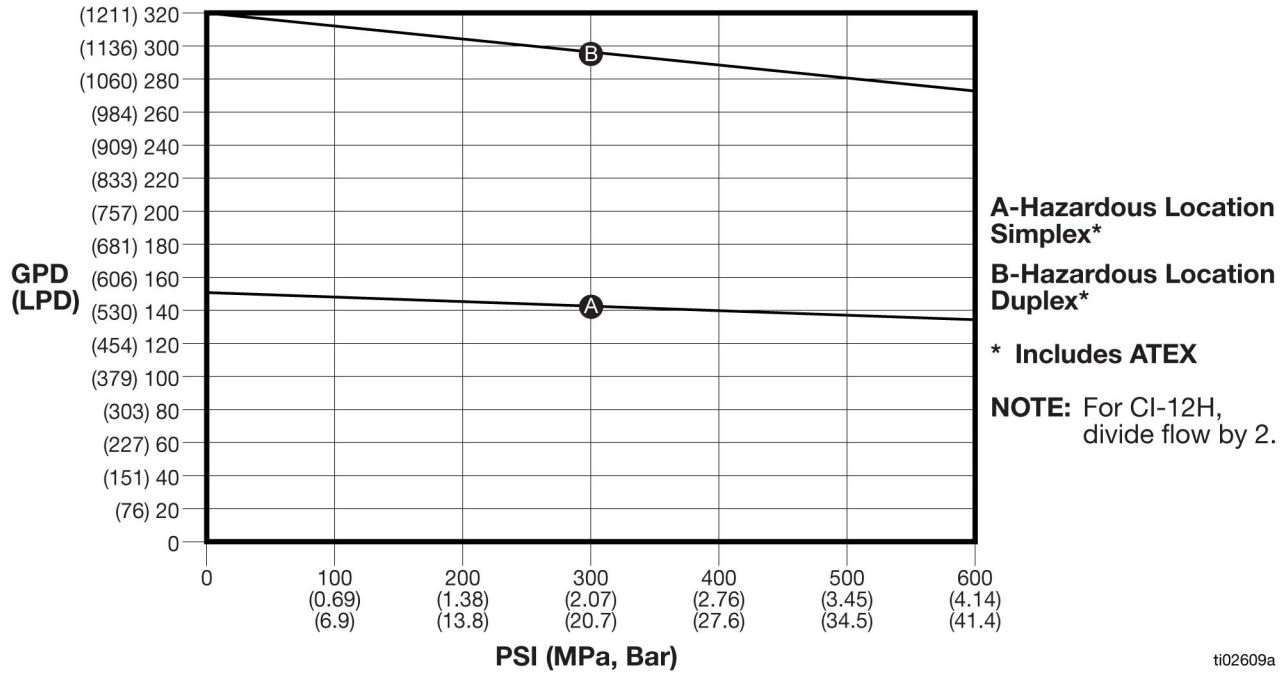


FIG. 43

Dimensions

Wolverine Advanced Pump Dimensions

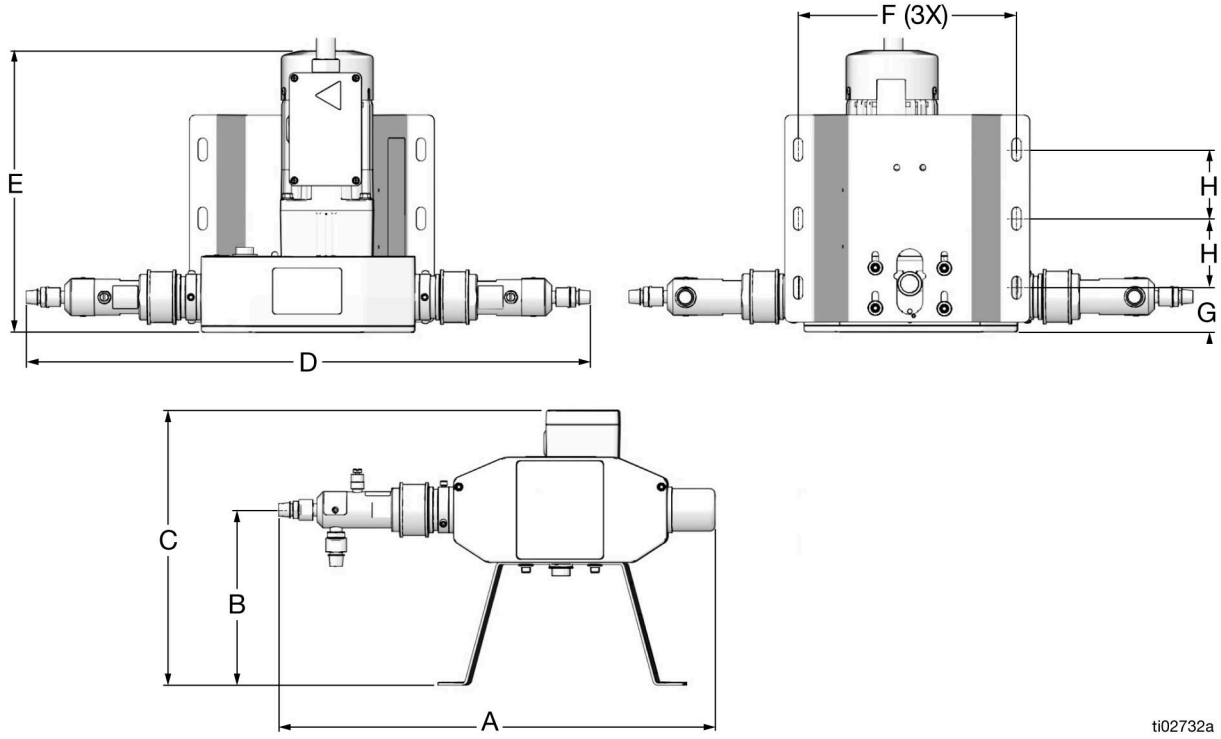


FIG. 44 Wolverine Advanced Pump Dimensions

A	B	C	D	E	F	G	H	J	K	L
16.3 in. (41.4 cm)	8.9 in. (22.6 cm)	4.5 in. (11.4 cm)	2.85 in. (7.2 cm)	11.9 in. (30.2 cm)	5.34 in. (13.56 cm)	3.0 in. (7.62 cm)	9.48 in. (24.08 cm)	0.41 in. (1.04 cm)	1.00 in. (2.54 cm)	23.7 in. (60.2 cm)

Wolverine Hazardous Location (C1 D1) Pump Dimensions

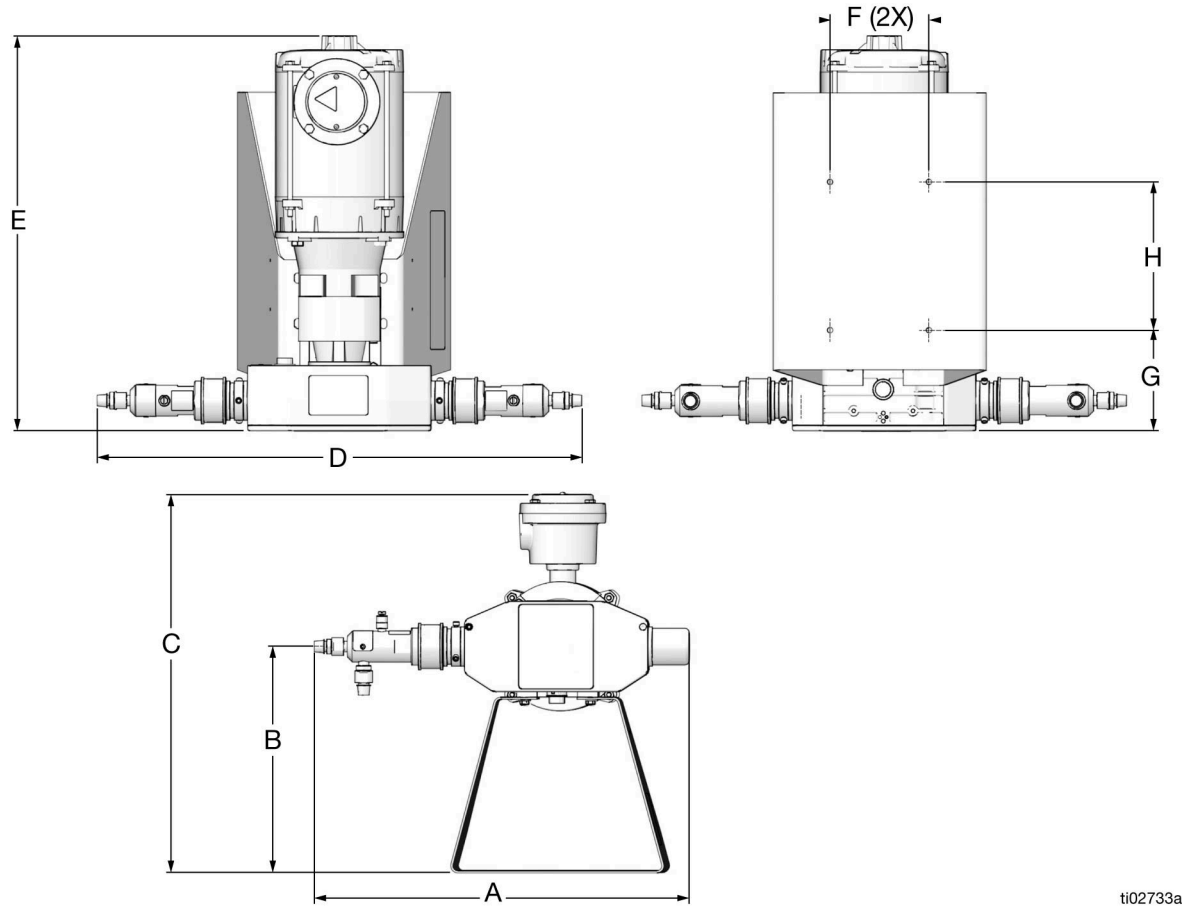


FIG. 45 Wolverine Hazardous Location Pump Dimensions

	A	B	C	D	E	F	G	H	J	K	L
AC Pump	16.3 in. (41.4 cm)	8.9 in. (22.6 cm)	4.5 in. (11.4 cm)	2.85 in. (7.2 cm)	19.6 in. (49.8 cm)	9.6 in. (25.1 cm)	7.5 in. (19.8 cm)	5.0 in. (12.7 cm)	0.281 in. dia (0.714 cm)	23.7 in. (60.2 cm)	19.6 in. (49.8 cm)
DC Pump	16.3 in. (41.4 cm)	8.9 in. (22.6 cm)	4.5 in. (11.4 cm)	2.85 in. (7.2 cm)	17.6 in. (44.7 cm)	9.6 in. (25.1 cm)	7.5 in. (19.8 cm)	5.0 in. (12.7 cm)	0.281 in. dia (0.714 cm)	23.7 in. (60.2 cm)	--

Wolverine ATEX Pump Dimensions

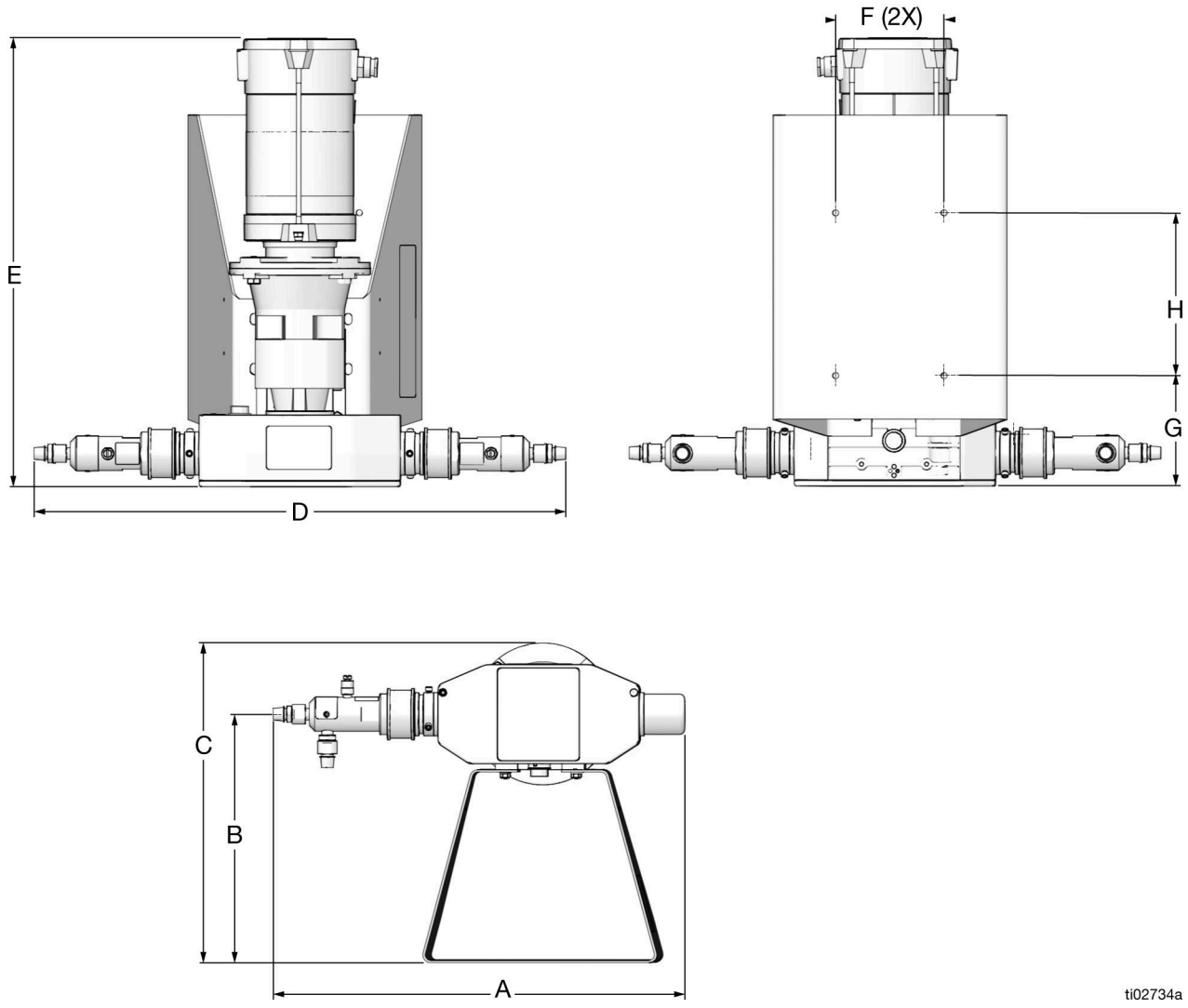


FIG. 46 Wolverine Hazardous Location Pump Dimensions

	A	B	C	D	E	F	G	H	J	K	L
AC Pump	16.3 in. (41.4 cm)	8.9 in. (22.6 cm)	4.5 in. (11.4 cm)	2.85 in. (7.2 cm)	20.63 in. (52.4 cm)	9.6 in. (25.1 cm)	7.5 in. (19.8 cm)	5.0 in. (12.7 cm)	0.281 in. dia (0.714 cm)	23.7 in. (60.2 cm)	14.19 in. (36.0 cm)
DC Pump	16.3 in. (41.4 cm)	8.9 in. (22.6 cm)	4.5 in. (11.4 cm)	2.85 in. (7.2 cm)	20.52 in. (52.1 cm)	9.6 in. (25.1 cm)	7.5 in. (19.8 cm)	5.0 in. (12.7 cm)	0.281 in. dia (0.714 cm)	23.7 in. (60.2 cm)	14.85 in (37.7 cm)

Wolverine Continuous Injection (C1 D2) Pump Dimensions

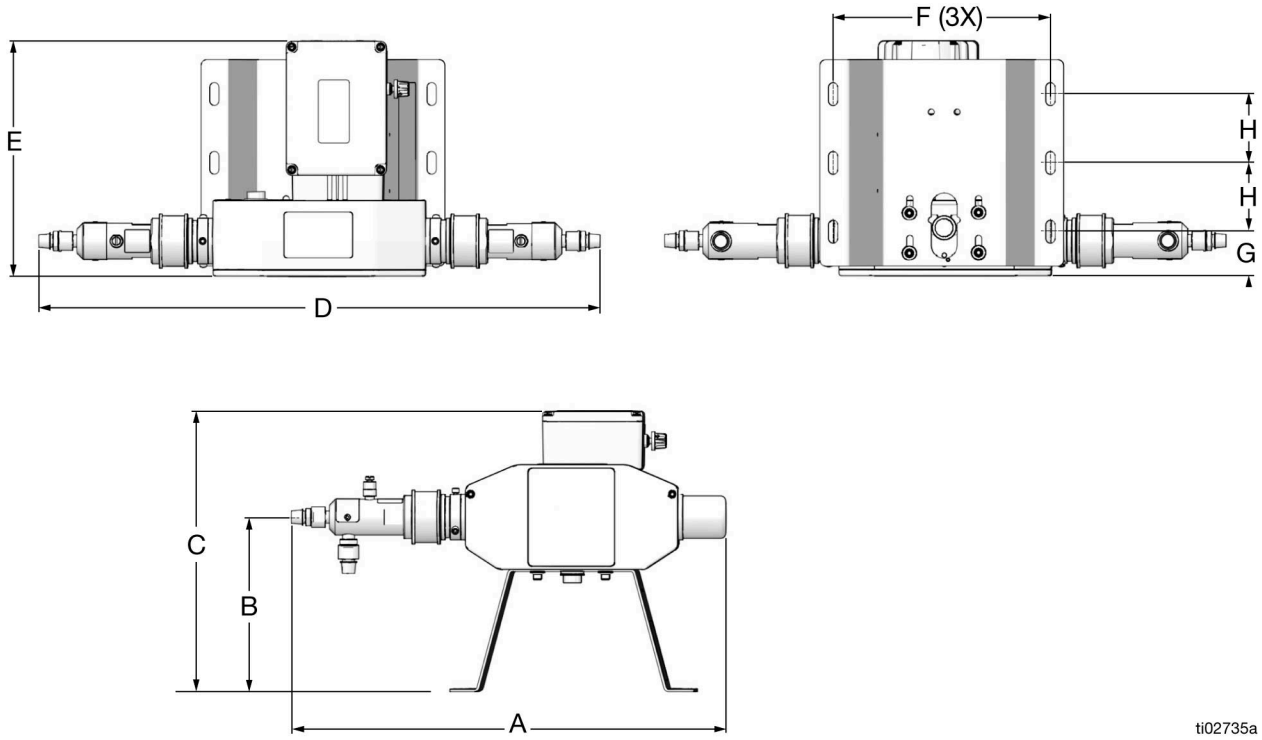


FIG. 47 Wolverine Continuous Injection Pump Dimensions

A	B	C	D	E	F	G	H	J	K	L
16.3 in. (41.4 cm)	8.9 in. (22.6 cm)	4.5 in. (11.4 cm)	2.85 in. (7.2 cm)	10.8 in. (27.3 cm)	5.34 in. (13.56 cm)	3.0 in. (7.62 cm)	9.48 in. (24.08 cm)	0.41 in. (1.04 cm)	1.00 in (2.54 cm)	23.7 in. (60.2 cm)

Technical Specifications

Wolverine Chemical Injection Pump		
	US	**Metric**
Maximum fluid working pressure	Varies by model, see **Models**, page 4	
Input Voltage (by **Drive Modules**, page 4)		
CI-12x-x	12 VDC	
CI-24x-x	24 VDC	
CI-1Ax-x	115 VAC	
CI-2Ax-x	230 VAC	
CI-3Ax-x	115 VAC or 230 VAC 3 Single Phase	
Maximum Input Current (by **Drive Modules**, page 4)		
CI-12L-x	16 A @ 12 VDC	
CI-12B-x	16 A @ 12 VDC	
CI-12H-x	23 A @ 12 VDC (Intermittent duty cycle, see page 21)	
CI-24H-x	12 A @ 24 VDC	
CI-24B-x	11 A @ 24 VDC	
CI-1AL-x	2.0 A @ 110 VAC Single Phase	
CI-2Ax-x	1.2 A @ 230 VAC Single Phase	
CI-3AH-x	4.8 A @ 110 VAC Single Phase	
CI-3AH-x	2.4 A @ 230 VAC Single Phase	
CI-2AX-x	1.5 A @ 230 VAC Single Phase	
Power Connection	See **Motor Electrical Connections**, page 17	
Environmental Temperature Range		
CI-xxL-x	-40° - 176°F	-40° - 80°C
CI-xxH-x	-13° - 104°F	-25° - 40°C
CI-xxB-x	-4° - 104°F	-20° - 40°C
Ci-xxX-x	-4° - 140°F	-20° - 60°C
Noise (dBa)		
Maximum sound pressure	< 70 dBa	
Inlet/Outlet Sizes		
Fluid inlet size	1/4 NPT(M)	
Fluid outlet size	1/4 NPT(M)	
Materials of Construction		
Pump/Check Valve Seal Material	See **Configuration Chart** on page 8 for seal material. All other packing materials are PEEK and PTFE unless otherwise noted.	
Wetted Parts	See **Configuration Chart** on page 8 for plunger material. All other materials are 316 stainless steel unless otherwise noted.	
Weight		
Wolverine Advanced/Continuous Injection,1 pump (Simplex)	35 lb.	16 kg
Wolverine Advanced/Continuous Injection, 2 pumps (Duplex)	39 lb.	18 kg
Wolverine Hazardous Location,1 pump (Simplex)	72 lb.	33 kg
Wolverine Hazardous Location, 2 pumps (Duplex)	76 lb.	34 kg

California Proposition 65

CALIFORNIA RESIDENTS

⚠ **WARNING:** Cancer and reproductive harm – www.P65warnings.ca.gov.

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This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

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